Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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Commercial Fisheries Abstracts

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0	General and theoretical	5	Vitamins
1	Fish by species	6	Fishery byproducts
2	Fresh fish	7	Analytical Methods
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4	Oils	9	Miscellaneous

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.321 STRUCTURE OF FILMS OF PROTEINS ABSORBED ON LIPIDES

Eley, D. D. and Hedge, D. G. (University of Nottingham, England)
Discussions Faraday Soc. No. 21, 221-8 (1956)
Chemical Abstracts 51, 6725 (May 10, 1957)

The changes in surface pressure ($\Delta\pi$) of cholesterol (I) and stearic acid (II) monolayers at pH 7.4 when protein solns. are injected below them have been measured in a Cr-plated brass trough for bovine plasma albumin (III), fibrinogen (IV), lysozyme (V), and insulin (VI). The initial pressures of I and II were 10 and 2 dynes/cm., resp. All of the protein was adsorbed on the lipoidal monolayer, none migrating to the clean side of the trough.

Two discontinuities in $\Delta\pi$ as a function of protein adsorbed suggest that proteins are adsorbed in successive layers. The first layer is denatured since it spreads to an area corresponding to one amino acid/lipoidal polar group with a specific area in sq. m./mg. of 2.6 under I and 1.4 under II. The 2nd layer is globular with a specific area of about 0.33 for all proteins except V which has an area of 0.43 under II. $\Delta\pi$ under I and II, resp., reaches the following max. in dynes/cm.: III 8.9, 7.4; IV 9.1, 13.4; V--, 8.8; VI 13.2, 17.7. As the pH is lowered below 6, $\Delta\pi$ produced by VI falls. By contrast $\Delta\pi$ produced by polyacrylic acid under I or II increases as the pH falls below 5. $\Delta\pi$ of III under II reaches 16.6 at pH 1.9. The structure of these lipoidal-protein surface layers is compared with the structure of cell membranes.

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0.5 BACTERIOLOGY OF CANNED FISH --1.

Riemann, Hans
Food Manufacture 32, 265-267 (June 1957)

Types of bacteria in spoiled canned fish. -- Bacteria that enter the can through leakage, usually during cooling of the cans, may consist of a mixed flora containing cocci, gram negative rods, and other types in varying numbers.

Bacteria that survive retorting are limited to a few species of heat resistant sporeformers. The most important of these species appear to be the mesophilic anaerobes (Clostridium sporogenes and Clostridium putrificum), which produce putrid swells, and mesophilic aerobes of the Bacillus species, which produce changes in flavor, color, and softening of the food. Obligate thermophilic, flat, sour organisms seem to be rare in canned fish. Bacteria from Norwegian canned fish and meat products that produce a type of spoilage similar to flat sours are most often present in underprocessed cans. In these studies half of the isolated species were Bacillus coagulans, one fourth were Bacillus circulans, and one-fourth were Bacillus circulans and Bacillus alvei intermediary types. Of the strains isolated from putrid swells, 83 percent were Clostridium parasporogenes, and 17 percent were Clostridium sporogenes. A small group of hard-swelled cans that contained only acid and gas showed, on isolation, 64 percent Bacillus subtilis, 21 percent Bacillus macerans, and 15 percent Bacillus subtilis and Bacillus alvei intermediary types. In Denmark almost all cans of spoiled fish contained Clostridium sporogenes, whereas Bacillus species were rare.

Incubation. -- Prior to examination, the author recommends that unspoiled cans should be held as long as possible at 30° C. and that the incubation time should be reported along with the results. Incubation for four days at 50° C. may be sufficient for spores of obligate thermophils since they do

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ABSTRACTER: Martin Heerdt

0.33 STUDIES ON THE NON-ENZYMATIC BROWNING OF FOODS--ORGANIC ACID--AMINO MODEL SYSTEMS

Bhatia, B. S.; Kapur, N. S.; Bhatia, D. S.; and Lal, Girdhari (Central Food Technological Research Institute, Mysore, India)
Food Research 22, 266-272 (May-June 1957)

Introduction. -- Work on the non-enzymatic browning of food products has centered around Maillard type reactions for some time. Recently, however, other systems responsible for browning have become apparent. Haas and Stadtman (1949) used ion-exchange resins to study browning in different fractions of apricot concentrate. Their findings showed that over-all browning results from at least four distinct types of reactions: (1) nitrogenous constituents and sugars, (2) nitrogenous constituents and organic acids, (3) sugars and organic acids, and (4) organic acids alone.

Purpose. -- This paper is concerned with an investigation of browning in organic acid-amino acid model systems.

Experimental. -- Equal volumes of 0.1 M solutions of 11 organic acids and 20 amino acids were mixed by taking one organic acid and one amino acid at a time and storing them in stoppered pyrex test tubes in an oven maintained at 55° C. The same organic acids and amino acids were also stored separately as controls at 55° C. A similar quantity of hydrochloric acid was added to all of the amino acid solutions to obtain uniform conditions of pH. Ultraviolet absorption spectra were measured in the region 220 to 300 millimicrons (mμ) at intervals of 5 mμ with a Beckman DU-spectrophotometer after 1, 5, and 10 weeks of storage. Fluorescence was measured after 1 and 6 weeks of storage, with a Klett Summerson Fluorimeter using a riboflavin filter (5200 Å), after adjusting the instrument to a scale reading of 200 with 0.1-milligram percent aqueous solution of quinine hydrogen sulfate. Intensity

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ABSTRACTER: Martin Heerdt

0.6 TEN YEARS' WORK ON MEAT AT THE LOW TEMPERATURE RESEARCH STATION, CAMBRIDGE

Callow, E. H. (Low Temperature Research Station, Cambridge, England)
Food Science Abstracts 29, 101-112 (April 1957)

This is an abstract of a paper presented by the author to Die zweite Arbeitstagung europaischer Fleischforscher at Kulmbach, Germany in July-August 1956.

Mathematics of meat carcasses. --Boneless meats (BM) or the combined fatty and muscular tissues from a carcass showed 77 percent water content on a fat-free basis. This makes possible a calculation of the relationship between the percentages of water (W/BM), protein (P/BM), and fat (F/BM) in boneless meats. The equation (W/BM = 77.0 − 0.770 F/BM) and (P/BM = 20.7 − 0.207 F/BM) are equally valid for pork, mutton, lamb, and beef, provided that the carcasses contain more than 18 percent of fatty tissue.

Composition of connective and fatty tissues. -- In a single muscle, the rectus femoris, the proportion of connective tissue decreases as the animal fattens, and the water content of the muscle on a fat-free basis also decreases. Connective tissue contains a series of components, ranging from collagen on the one extreme to reticulin on the other, which exhibit varying amounts of sulphur and varying behavior under the action of the enzyme collagenase and under treatments with moist heat and with silver salts. In pigs fed 50-percent whale oil, the kidney fat--which is laid down most rapidly--contained only 38 percent of the fat from whale oil; whereas the outer layer of back-fat--which is laid down least rapidly--contained 64 percent of the fat from whale oil. The fat from these pigs contained peroxides, even when the pigs were alive. A method based on ferric thiocyanate was shown to be more sensitive and less subject to light for measuring the peroxide content of fat than the iodometric method.

Pigments. -- The color of the meats depends largely upon its myoglobin and haemoglobin content

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ABSTRACTER: Martin Heerdt

STRUCTURE OF PROTEIN FILMS

NON-ENZYMATIC BROWNING

BACTERIOLOGY OF CANNED FISH

TECHNOLOGY OF MEAT

0.33

of visible color was measured as optical density with a Lumetron colorimeter using a blue filter (420 mμ) after 2, 5, and 10 weeks of storage. Values for pH were read on a Phillips electric pH meter after 10 weeks of storage.

Results with ultraviolet absorption spectra. -- The positions of the peak in the ultraviolet region of the brown precursors involved in the organic acid-amino acid complexes were tabulated. Freshly prepared organic acid solutions showed no peak in the region 270 to 285 mμ; however, the peak began to develop during storage except in the case of oxalic and malic acids. Malonic acid gave a peak of 270, 280, and above 300 mμ after 1, 5 and 10 weeks of storage, respectively. The amino acids containing —S–S— or –SH– linkage (cystine and cysteine) did not develop brown precursors during 10 weeks of storage at 55° C. Amino acids containing an indole ring or phenolic group (tryptophane or tyrosine) induced browning faster than other amino acids. Pyruvic and maleic acids appeared to retard the browning reaction in organic acid-amino acid systems.

Results with fluorescence. -- In general fluorescence values increased during storage except in organic acid-tryptophan systems in which it decreased as the brown color appeared. An increase in fluorescence values indicates the formation of brown precursors.

Results with visible color. -- In all organic acid-tryptophan systems, the color after 10 weeks was dark brown, probably owing to the presence of the indole ring. A slight yellow color also developed in histidine-organic acid systems, and a faint yellow color developed in a few other systems.

Results with pH values. -- After 10 weeks of storage, pH values ranged from 1.2 to 1.75. According to these values in the ranges studied, pH alone is not the determining factor in the browning of organic acid-amino acid systems.

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and on the changes in the meat pigments that are brought about by oxidation. Biochemical differences were found between red and white muscle.

Changes in muscular tissue post-mortem and rigor mortis. -- In whale muscle, many hours may elapse before rigor develops. In cattle and horses, the psoas muscle goes into rigor more rapidly than the longissimus dorsi muscle. The cause of rigor mortis is the disappearance of high energy phosphate in the form of adenosinediphosphate. Creatine phosphate and pH also decrease.

Microbiology of meat. -- The two most important factors in the growth of microorganisms in meat are pH and Eh. In dry salted hams, pH was all important to the anaerobic bacteria found; and a decrease in pH of 0.2 can be critical for preventing the growth of bacteria. Clostridia isolated from horse muscle grow rapidly at Eh –40 mV, whereas at higher Eh values the lag phase increases until at Eh + 230 mV no multiplication occurs and the organism gradually dies out. Muscle, shortly after death, can have an Eh value as high as Eh + 250 mV. Work on Eh was started to find reasons why the clostridia found in whale meat did not multiply and cause putrefaction until rigor mortis had occurred.

Chilling, freezing, and thawing of meats. -- Muscular tissue frozen prerigor entered into rigor more violently upon thawing and gave more drip than muscular tissue frozen after rigor mortis had occurred. Whale meat frozen prerigor lost as much as 45 percent of its weight as drip. This loss could be reduced to 20 percent if the whale meat was held at 27° F. for one or two days before thawing at ordinary temperature. Drip from beef was much smaller in amount than that from whale meat. The drip from large pieces of beef averaged 0.75 to 2.00 percent of the weight of the carcass. Fatter carcasses lost lesser amounts of drip, but a single piece of meat may lose as much as 7 percent of its weight in drip. Deterioration due to rancidity in frozen whale meat could be prevented by glazing the frozen blocks of whale meat with ice prior to storage. A liquid-gas chromatographic analysis proved that the fishy flavor in frozen whale meat is due to the presence of three methylamine bases and trimethylamine.

Ninety references were cited.

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0.5 Cross Reference: 3.33)

not ordinarily become dormant. Bacteriological examinations are preceded by a visual examination for mechanical condition of the can, the amount of swelling, the quality of the seam, the presence of pin holes, and code marks.

Opening a can. --Dirty cans should be cleaned with soap and water before they are opened. Drying can be accomplished conveniently by wiping the lid of the can with ethanol, after which the can is sterilized by slow rotation in the flame of a Bunsen burner. A flamed, sharp pointed sterile rod, one to two centimeters in diameter is the most convenient piercing instrument for entering cans.

Sampling of the can. --Sterile cotton-plugged cork borers or glass tubes are convenient for removing a cylinder from the center of cans of solid packs. A glass rod may be used to recover the cylinder. The sample of food is then emulsified with sterile saline solution and inoculated into the media with the aid of a pipette. Usually 1 to 2 grams of inoculum sample is taken from the center as well as from the surface of the can if the food is a solid pack. Liquids are usually sampled with a sterile pipette.

Culture media. -- The choice of media is not critical, providing aerobic and anaerobic media are used. To detect dormant spores, special precautions are required because anaerobic germination is enhanced by a number of factors. In low acid foods, dextrose tryptone broth inoculated and incubated at 37° C. and 55° C. is recommended for the culture of aerobes, whereas liver broth incubated anaerobically at the same temperature is suggested for anaerobes. Brain medium inoculated in the deep provides for the growth of most bacteria found in canned fish, and it is equal to or better than other media including liver broth, skim milk, pork infusion broth, and RCM medium with regard to anaerobes.

0.5 RAPID TEST ESTIMATES BACTERIAL COUNT IN 5 HOURS

Anonymous
Frosted Food Field 24, 24 (June 1957)

A rapid method for estimating the bacterial content of precooked frozen foods was described by Robert P. Straka of the Western Utilization Research Branch, U. S. Department of Agriculture, Albany, California, at the recent annual convention of the Institute of Food Technologists in Pittsburgh.

As Dr. Straka pointed out, the susceptibility of many prepared foods to microbiological contamination has made the development of rapid methods for determining bacterial count imperative. Nevertheless, at the present time the majority of techniques require two to three days.

The new method, developed by the USDA, by contrast, requires only three to five hours, according to Dr. Straka.

The new technique is a modification of the resazurin reduction method originally devised by the dairy industry to assay possible contamination of milk products.

Basically, the new assay works as follows: the test sample is mixed with distilled water and added to the blue dye, resazurin, and incubated. The bacteria reduce the resazurin, changing it from blue to colorless. The length of time required for the dye to lose its color is an indication of the number of microbes present.

The best results are obtained with this test, Dr. Straka said, when the contamination is great and a large number of bacteria are present.

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2.118 A STEAM-HEATED DRIER OF NOVEL CONSTRUCTION AND GREATLY REDUCED DIMENSIONS

Solheim, P.
Konkylien 1, 17-20 (December 1956)

A complete line of machinery has been designed in Norway for processing fish into meal and oil aboard the trawler Havkvern. This is the first trawler known to have been arranged exclusively for the reduction of its fish catch to meal and oil. Features incorporated were: a capacity of 50 to 60 tons of fresh fish per 24 hours, compactness, and reliability in a heavy sea. Satisfactory shipboard performance was obtained from a standard cooker and press with only minor variations. A drier that would function efficiently during the rolling and pitching of the ship, however, was more difficult to develop until low pressure steam heat was selected.

Figure 1 (see over) shows a longitudinal section of the drier, which consists of a stationary horizontal cylinder with its total length enclosed by a steam jacket. Inside the cylinder is a rotor specially designed to concentrate as much heating surface as possible in the interior of the cylinder. This rotor consists of a hollow central tube, fitted throughout its entire length with a great number of plates or discs. These plates are welded to the shaft of the center tube at comparatively short intervals. All the discs have the same outside diameter, which is a little smaller than the inside diameter of the cylinder. In this way there is an annular space between each plate and the inside wall of the cylinder. This space serves as a passage for the material to be dried.

The center tube and all discs are heated by steam. The construction of the rotor makes it possible to obtain a large concentration of heating surface per unit of cylinder volume and an unusually high drying capacity. A steam inlet and a condensate outlet is provided for each disc and the system is arranged in such a way that steam and condensate flow in the same direction through each plate or disc. The steam jacket and the rotor also have outlets for condensate in both ends to ensure removal

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ABSTRACTER: Kathryn L. Osterhaug

2.118 BULK-FREEZING OF FISH

Heen, Eirik; Karsti, Olaf; and Bagge-Lund, Einar (Norwegian Fisheries Research Institute, Bergen, Norway)
FAO Fisheries Bulletin 10, 89-98 (April-June 1957)

The term "bulk-freezing" refers to fish frozen aboard vessels for subsequent distribution in the thawed state as fresh fish, fish fillets frozen in blocks for fish sticks, and products for pet foods and bait. It does not refer to fish frozen in consumer and institutional packs.

Bulk-freezing of fish plays an unimportant part in the world trade in general (except tuna, herring, salmon, and halibut) as compared with the volume of "consumer goods." There is, however, a potential demand for bulk-frozen fish: (1) for leveling out the fish supply in some processing industries; (2) for disposing of catches in a simplified manner during gluts; and (3) for utilizing abundant resources in remote waters.

Commercial activities.--Approximately 200,000 tons of tuna are bulk-frozen every year. The main catches of tuna are frozen aboard the fishing vessel. The freezing is performed in a simple manner by circulating brine through steel tanks fitted with cooling coils and loaded with fish.

Practically all frozen herring are processed in bulk for future canning, smoking, curing, or "marinading". Sardines and sprats are frozen as raw material for sardines in oil, whereas the larger herring usually go into smoked products and are distributed in a semi-perishable state at local markets.

Herring usually are frozen in brine, as this is a simple and highly efficient method, but it is not well suited for long storage. Rancidity is pronounced after 6 to 8 weeks. Herring frozen in blocks

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ABSTRACTER: Kathryn L. Osterhaug

2.149 CHARTING THE SEAS TO HELP TRAWLERMEN

Lumby, J. R. (Fisheries Laboratory, Lowestoft, England)
World Fishing 6, 74-80 (May 1957)

From the standpoint of navigation, present-day nautical charts benefit the fisherman as much as any sea traveler, especially in inside waters and upon the continental shelves. Trawlers today are finding productive grounds at the edges of the continental shelves and even far out on the continental slopes. Although more accurate charts for these deeper areas are not needed for adequate navigational purposes, detailed knowledge of the topography of the ocean bottom is important to trawlermen because certain features cause ocean upwelling currents that provide nutritious conditions necessary for the growth of the smallest organisms in the food-chain. It is in and near such areas that fishing is likely to be better. Knowledge of growths on the sea beds that may hamper the operation of bottom gear is also important to trawlermen.

Among factors that affect the success of trawl fishermen, are currents, temperature, and salinity. Not only are the surface currents important, but those near the bottom are perhaps even more important in the way they affect the gear and the fish.

Salinity and temperature are the two most widely known properties of sea water. Different species of fish prefer certain degrees of these properties, although many fish can tolerate a wide range of conditions providing the changes are gradual. Various combinations of salinity and temperature can be said to create "climates" in the sea. Over a period of years changing marine "climates" in some areas has had considerable affect on the general distribution of fish.

Surface temperature observations have been made since about the middle of the 19th century, and

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ABSTRACTER: Melvin R. Greenwood

RAPID BACTERIAL COUNT

BULK-FREEZING FISH

SHIPBOARD MEAL DRIER

CHARTS AID TRAWLING

2.118 (Cross Reference: 3.234)

with a thickening agent such as alginate jelly have a satisfactory storage life.

Bulk-freezing methods.--Brine freezing is the freezing of fish in direct contact with a refrigerated liquid. A sodium chloride solution is the most important and probably the only solution that may be used for freezing on an economical basis. Other ingredients may be added to the sodium chloride brine in certain instances. To keep salt penetration into the fish at a minimum, the temperature of the brine must be at or near the freezing point of the brine. Brine temperatures of about 1.4° F. are usually obtained.

The most common methods of applying brine to fish are (1) by spraying and (2) by immersion. These methods require comparatively inexpensive apparatus, are simple to operate, and have large capacities in relation to the size of the plant. In Norway, winter herring are frozen by spraying refrigerated brine over the fish in slatted boxes. In the United States tuna is frozen by brine immersion; and, on board the U. S. Fish and Wildlife Service's experimental trawler Delaware, fish are frozen in perforated baskets that travel through refrigerated brine.

In air-blast freezing, air carries the heat from the fish to the refrigerator coils. The advantages of this method over brine freezing are flexibility and better sanitation. The disadvantages are poor heat transfer to and from the air, formation of ice on the cooling coils which results in slower freezing and in the drying out of food by the absorption of moisture in the air. The use of air-blast for the bulk-freezing of fish is found mainly in plants ashore and on fishing boats dealing with large fish, such as halibut, tuna, and salmon.

Indirect contact freezing is a system in which the frozen food is separated from the cold-bearing medium by a metal plate that forms the walls of adjacent chambers. This type of freezer, although originally developed to freeze a consumer pack, has been used to an increasing extent for the freezing of fish in larger packs and blocks that fit the category of bulk-freezing.

2.149

today charts of these conditions are generally available. Subsurface temperature and salinity information has been commonly recorded since the turn of the century, and in many regions the periodical variations are at least fairly well known. Several countries of the world regularly publish charts of surface temperatures, salinity, currents, and winds during certain months or seasons in localized areas.

It is probable that, for the present, marine "weather" charts are likely to be of more value in the study of fisheries than in practical fishing. Very few fishermen can be accustomed to use such charts and, it must be admitted, our understanding of the behavior of fish in relation to their environment is not yet perfectly clear.

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When less than 100,000 bacteria per gram of food is present, the reduction takes five hours; for counts of 100,000 to 1,000,000 bacteria per gram, three to five hours are required; while under three hours is necessary to complete the color change for bacterial counts over 1,000,000 per gram.

2.118 (Cross Reference: 6.134)

of all condensate whatever the trim of the ship.

The cylinder is also provided with an inlet for the wet material and an outlet for the dried material. The outlet is of a special design incorporating a type of weir arrangement, the position of which can be regulated in order to adjust the level of material in the drier. This outlet is also equipped with a port at a lower level through which the contents of the drier can be emptied if the machinery is stopped. Figure 2, below, shows this arrangement. As soon as the wet material has filled the drier to a certain level, it flows between the revolving discs, and is vigorously agitated against the heating surface.

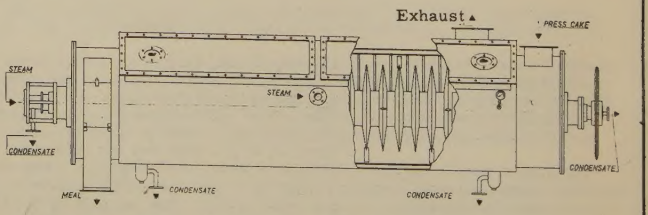

Figure 1.

To intensify the agitation of the material in the annulus between the discs and the wall of the cylinder, each disc is equipped with a paddle that extends outwards and disturbs any material tending to adhere to the wall of the cylinder. No special arrangement is needed to ensure the transfer of the material from the inlet to the outlet. Uniformly dried material leaves the drier at a constant rate, even in a heavy sea.

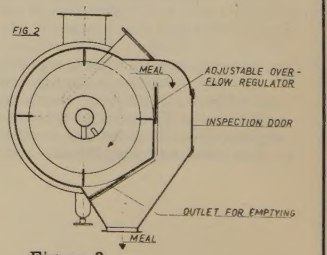

Figure 2.

2.112 LONGLINE AND TROLL FISHING FOR TUNA IN THE CENTRAL EQUATORIAL PACIFIC, JANUARY 1955 TO FEBRUARY 1956

Iversen, Edwin S. and Yoshida, Howard O. (Pacific Oceanic Fishery Investigations, Honolulu, T. H.)
Special Scientific Report: Fisheries No. 203, 38 pp. (February 1957) (Washington, D. C.)

The results of nine fishing cruises to the Line Islands area by POFI vessels during March 1955 to February 1956 are discussed. The catch rates obtained by longlining indicated that the abundance of yellowfin, Neothunnus macropterus (Temminck and Schlegel), was low as compared with previous years.

Yellowfin caught by surface trolling close to the islands were smaller than the deep-swimming yellowfin caught by longlining both near the islands and in the open ocean. Longline catch rates close to the islands were generally higher than their oceanic counterparts.

Chemical sounding tubes were used to determine the depth fished by the longline. The data indicated that the deepest hooks fished greater depths at 5° to 6° N. than near 1° N. latitude. There was no significant relationship between the catch rates on the deepest hooks and the depth of fishing.

From 1,056 yellowfin captured and tagged in the Line Islands area, there were 2 recoveries prior to September 1956, both from the same area in which they were released.

Authors' summary

3.12 UPTAKE OF AUREOMYCIN CHLORTETRACYCLINE BY FISH AND ITS HEAT INACTIVATION

Tomiyama, Tetuo; Yone, Yasuo; and Mikajiri, Kazuo (Kyushu University, Fukuoka, Japan)
Food Technology 11, 290-292 (May 1957)

Purpose. --This study was made to obtain more information about: (1) the uptake of chlortetracycline (CTC) by round fish, (2) its distribution in fish muscle, and (3) its destruction by heat.

Experimental. -- Uptake, distribution, and heat destruction of CTC in four species of round fish and in fish fillets were determined by the modified pad plate assay method of Brady and Williams (1953) and Kohler and Albey (unpublished).

Results. --Tabulated results appear in tables 1, below, 2 and 4 (see over). CTC did not penetrate into the muscle tissue of round fish immersed for 24 hours in chilled sea water that contained 10 parts per million (p.p.m.) of CTC except in the case of small fish with incompletely developed scales, such as pilchard and common mackerel. The

Table 1. CTC content (p.p.m.) of round fish after storage for various time intervals at 4° C. in sea water containing 10 p.p.m. CTC

Kinds of fish	Average body (cm.)	Hours of storage					
		0	2	6	27	50	70
Pilchard[1]	7	0	1.0	1.0	4.0		
Pilchard[1]	13	0	1.0	1.6	2.7	2.8	
Common Mackerel[2]	14	0	1.0	1.5	2.1		
Common Mackerel[2]	25	0	0	0	0		
Horse Mackerel[3]	19	0	0	0	0		2.8
Horse Mackerel[3]	24	0	0	0			
"Madai"[4]	8	0	0	0	0		

[1]Sardinia melanosticta. [2]Scomber japonicus. [3]Trachurus japonicus. [4]Pagrosomus major.

ABSTRACTER: Martin Heerdt

3.19 EFFECT OF IONIZING RADIATIONS ON SOUTHERN OYSTERS

Gardner, Elizabeth Ann and Watts, Betty M. (Florida State University, Tallahassee)
Food Technology 11, 329-331 (June 1957)

The present study was made to determine if oysters can be irradiated at dosages high enough for partial or complete sterilization without causing undesirable side reactions in the oysters. The authors also measured the extent to which irradiation of the oysters inhibited souring by following the pH changes in uncooked oysters.

Raw material. --Atlantic oysters (Crassostrea virginica) used in this study were tonged from Cat Point Reef or purchased either in the shell or freshly shucked from a commercial opening house in Apalachicola, Florida. Shell oysters either tonged or purchased were dry shucked into their own liquor and immediately washed by suspension in tap water for 30 seconds. The commercially shucked oysters that were purchased had been shucked into buckets of water, placed on skimmers, sprayed with fresh water, drained for 5 minutes, and packed in metal friction-top cans. These cans were held in ice.

Radiation and storage. -- All of the experiments were performed with gamma ray emission from Co^{60} that initially gave 3.58×10^5 roentgen equivalents potential (rep) per hour. Irradiation was carried out on shucked oysters packed either in glass vials with screw-on plastic tops or in glass test tubes sealed with tight fitting corks and dipped in melted paraffin. Control samples and irradiated samples both were held at room temperature during the irradiation period. They were then stored as long as 20 days either at room temperature or at 5° C.

Examination and assay. --A control sample and an irradiated sample from each experimental treatment were opened and compared immediately after irradiation and at periodic intervals during the study. Oysters and liquor were evaluated for odor and appearance. At intervals uncooked oysters were assayed qualitatively (1) for the presence of free sulfhydryl groups by the nitroprusside

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ABSTRACTER: Martin Heerdt

3.24 A REVIEW OF THE DEVELOPMENT OF JACKETED COLD STORES FOR FROZEN FOODS

Eddie, G. S. (Torry Research Station, Aberdeen, Scotland)
Modern Refrigeration 60, 225-227 (June 1957)

In cold storages of normal design, the air in contact with the produce is also in contact with the refrigerated metal surfaces of the coolers. Heat is continually entering the store through the insulation and from fans, lights, workers, and door opening. The surface of the cooler must be at a lower temperature than the air in the store in order to effect the removal of this heat. The produce, on the other hand, will be at or above the air temperature. The vapor pressures of the moisture in the produce is higher than the vapor pressure of water or ice in contact with the cooler, therefore, there is a continual pressure difference or force driving water from the produce to the cooler. This is the basic cause of the well-known phenomenon of cold store desiccation which results in "freezer-burn."

There are two mechanisms of water transfer: first, direct sublimation or diffusion which depends upon (1) the partial pressure difference, (2) the total pressure, (3) the distance of separation and the areas of produce and cooler, and (4) the factors affecting escape of water molecules from the surface of the produce and their accumulation on the cooler. The second mechanism of water transfer is that of convection, and the factors here are the same as those that affect heat transfer. Reductions in rate of desiccation can be achieved by lowering the temperature difference between produce and cooler. Temperature difference can be reduced in three ways: (1) reducing load on the cooler, (2) increasing the coefficient of heat transfer from cooler to air, and (3) increasing the area of the cooler.

Three procedures are normally adopted to counter-act desiccation or its effects. First, it is common to pack an excess weight of the product to compensate for shrinkage. This is expensive and

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ABSTRACTER: Kathryn L. Osterhaug

FISHING FOR TUNA

ABSORPTION OF CTC IN FISH

IRRADIATED OYSTERS

JACKETED COLD STORES

3.12

skin and gills of round fish, however, did show a measurable absorption of CTC. Bonito surface muscle without skin absorbed as much as 2.4 p.p.m. of CTC during immersion in 4° C. sea water that contained 10 p.p.m. of CTC, whereas bonito muscle 10 millimeters or more in depth from the surface absorbed no CTC.

The rate of destruction of CTC in bonito muscle increased markedly with each increase in temperature from 55° C. to 76° C. to 93° C. A change in residual CTC, therefore, can be expressed as an exponential function of the interval of the application of heat.

Table 2. CTC content (p.p.m.) in various parts of round fish, "isaki" (Paropristipoma trilineatum) after storage in CTC-sea water (10 p.p.m.) at 4° C.

Tissue	Hours of storage			
	0	2	6	27
Flesh	0	0	0	0
Viscera	0	0	0	0
Skin	0	1.0	1.0	1.0
Gills	0	1.0	1.0	1.0

Table 4. Residual amount of CTC in Bonito fillets after heating at varying temperatures

Time of heating (minutes)	Temperatures					
	55° C.		76° C.		93° C.	
	p.p.m.	%	p.p.m.	%	p.p.m.	%
0	21.0	100	21.0	100	21.0	100
5	16.0	76	14.0	67	13.0	62
10	15.0	71	10.7	54	8.7	41
30	11.0	52	4.0	19	1.6	7.6
60	10.5	50	0.0	0.0	0.0	0.0

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does not avoid loss in quality, since desiccation is largely irreversible. Second, wrappings impervious to water vapor may be used. Wrapping under commercial conditions can effectively delay desiccation for long enough to be a practical solution, but effective wrapping is too expensive for most species of whole fish. A third procedure is to provide a water glaze which must evaporate before desiccation of the product begins. The defect of this method is that in most existing cold stores the glaze will last only a matter of weeks and it is too expensive to reglaze large quantities of cheap fish.

The alternative is to remove the cause of desiccation by adopting modified or unconventional designs of store. One method is to surround the store with a refrigerated jacket hermetically sealed from the store. The heat entering the insulation is absorbed in the jacket and there is normally no cold metal surface or fan in the store itself. The cooler will frost up very slowly as it is working in a hermetically sealed space. It is necessary to arrange for defrosting the cooler and draining away the the moisture. The biggest practical difficulty is in hermetically sealing the linings and it is here that any significant increase in cost will develop. Although the jacket takes up space, produce may be stored right up to the linings.

A cold store with a hermetic jacket is not suitable for freezing or cooling the produce. Ideally the frozen food should be put in the store at the storage temperature. The jacketed cold store was first seriously proposed by A. G. Huntsman of the Atlantic Fisheries Experimental Station at Halifax, Nova Scotia. Practical methods of construction were developed by A. W. Lantz, of the Pacific Fisheries Experimental Station, Vancouver, B. C., both for land stores and salmon scows. One big difficulty was finding a material for the linings and in sealing the joints. Lantz settled on high-grade five-ply with a layer of aluminium. His method of refrigeration is by unit cooler and fan and he has worked out complicated schemes of baffles to distribute air from the one cooler evenly round four, five or six sides of a room as may be required. The final adjustment of air distribution has to be done by experts on site. A commercial cold store was erected in Vancouver, Canada with government assistance some years ago and appears to have given great satisfaction.

2.112

3.19 (Cross Reference: 1.81)

test of Watts et al. (1955), (2) for catalase activity with 3 percent hydrogen peroxide by the method of Gardner and Watts (1957), and (3) for pH with a model H2 Beckman pH meter.

Uncooked oysters. --Shucked oysters were divided into control and experimental lots. The experimental lots were irradiated for 10 to 100 minutes (1) at low dosages ranging from 6.3×10^4 to 6.3×10^5 rep and (2) at sterilization doses ranging from range 8.3×10^5 rep to 3.5×10^6 rep. All lots were stored at 5° C.

Cooked oysters. --Shucked oysters were drained and cooked in glass beakers submerged in water at 212° F. for 6 minutes. By this time the temperature of the oysters had reached 159° F. (70° C.) and catalase was completely inactivated. These cooked oysters were divided into two lots. Lot 1 was irradiated with 1.69×10^6 rep for 4 hours and 52 minutes at room temperature. Lot 2, which was not irradiated, was held as a control lot at room temperature for the same period as lot 1.

Uncooked oysters with antioxidants. --Shucked oysters were also irradiated in the presence of various antioxidant substances that were known to be free radical acceptors in an attempt to eliminate the "grassy" odor common to irradiated oysters.

Results. --Irradiation of shucked uncooked oysters with gamma rays up to doses of 3.5×10^6 rep produced an off-odor described as "grassy". Neither free sulfhydryl groups nor catalase activity were noticeably reduced by this amount of irradiation. Subsequently, both the control and the irradiated oysters showed a drop in pH and became sour. This type of spoilage probably was caused by enzymes within the oyster and not by bacteria. Radiation of shucked cooked oysters produced an off-odor described as "oxidized". Neither of the odors could be prevented by the addition of various antioxidants and free radical acceptors prior to irradiation. The oysters found most acceptable after brief storage periods were those that had been irradiated raw and then heated sufficiently to destroy enzymes. Heating the oysters after irradiation eliminated the grassy odor and protected them from enzymatic souring. Fairly high doses of irradiation were required to kill live oysters in their shells, and even then the shells did not open immediately. Irradiation does not appear to be an effective means of opening live oysters for the removal of the meats.

3.12 ANTIBIOTICS AS A MEANS OF PRESERVING FISH

Anonymous
Arsberetning fra Fiskeriministeriets Forsogslaboratorium for 1956 (Annual Report to the Danish Fishing industry with English translation of the main experimental results) p. 31 (1957) (Copenhagen, Denmark)

By icing North Sea fish on board ship, it was shown that the addition of aureomycin checked the growth of bacteria on the fish. The difference between aureomycin-iced fish and normally iced fish was more pronounced here than in the laboratory-scale experiments. Towards the end of the icing period, after about 2 weeks' storage in ice, the total bacterial count rose to 20 to 50 million per gram of fish flesh in the normally iced fish, while in most of the aureomycin-iced fish, the count was under 1 million bacteria per gram.

Considering this drastic influence on the growth of bacteria, it was strange, and disappointing, to find that aureomycin could not delay spoilage of the fish as judged by appearance, odor and flavor, more than a couple of days, and that differences in the appearance, odor and flavor of the fish appeared only in the last part of the icing period. On taking the fish up from the ship's hold the aureomycin-iced fish did not vary markedly from the normally iced fish, apart from the bacterial count. The cod had then been iced for 10 days, the plaice for 13 to 14 days.

Reprinted in part

3.332 CANNING PILCHARDS IN CORNWALL

Dewberry, Elliot B.
Food Manufacture 32, 268-271 (June 1, 1957)

Fishing.--Pilchards (Sardina pilchardus) are taken from June to February in drift nets up to 20 miles off shore in the southwestern waters of the English Channel and along the south coast of Cornwall as far as the Eddystone. The nets are set shortly after sunset or just before sunrise by diesel powered vessels equipped with "echometers" for locating the shoals of fish. They are examined at 1 or 2 hour intervals until a large number of fish have been taken. To insure the crew a living, the catch taken at each set must weigh at least 1250 pounds. The drifter vessel returns to port immediately upon cessation of fishing so that the fish may be landed when only a few hours out of water.

Unloading.--At Looe Harbor quay the pilchards are loaded into cane baskets, weighed, transferred to wooden or metal boxes, and collected by motor vehicles for transportation to the canneries. At the cannery, the pilchards are inspected and immediately taken to the feed tables of the nobbing machines. Here operators, two to each machine, place the fish in slots or pews on the machine belts at the rate of 65 to 80 pilchards per minute. These machines remove the head of the pilchards with a clean cut, and at the same time pull out the stomach and gut leaving the roe or milt in place. Water jets are arranged to clean the knives and the gut extracting rollers and to push the fish into position for removal of the tail by a circular knife on the machine. Each machine has an hourly average output of 15,000 pounds.

Washing and scaling.--The dressed pilchards are then discharged into pans and removed to an electrically driven scaling and washing machine, the cylinder of which holds about 50 to 75 pounds

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ABSTRACTER: Martin Heerdt

3.331 IDENTIFICATION OF THE PINK PIGMENT OF CANNED TUNA

Brown, W. Duane and Tappel, A. L. (University of California, Davis)
Food Research 22, 214-221 (March-April 1957)

In this report the authors present the results of experiments that lead to the identification of a characteristic pink pigmentation in precooked tuna tissue. The research was supported by funds from the U. S. Fish and Wildlife Service and carried out under contract with the University of California.

Experimental.--Materials used were whole yellowfin tuna (Neothunnus macropterus) and commercially precooked loins from yellowfin tuna. Both materials were held in frozen storage until used. Various samples of canned tuna purchased at retail were also used. A Beckman DR spectrophotometer equipped with a reflectance attachment was used to read and record reflectance spectra on the surface of the cooked tuna, which usually was painted with an aqueous solution of sodium hydrosulfite.

Possible formation of denatured globin hemochrome.--Powdered cattle hemoglobin (enough to make a 0.02 molar solution) was dissolved in phosphate buffer at pH 7.0. Three milliliters (ml.) of the resulting solution was placed into tubes, and the tubes were held in water at 212° F. for intervals of 5 to 30 minutes. The precipitate that formed in the tubes was filtered out, washed three times with distilled water, placed in 10 ml. of 10-molar urea solution, and held overnight at room temperature with periodic agitation to effect solution of most of the precipitate. The resulting urea solutions then were filtered and their absorption spectra read and recorded with a Beckman DR spectrophotometer. To test for hemochrome formation a model system was prepared by using dilute solutions of various non-heme compounds, crystalline hemin, various reducing compounds, and water.

Laboratory heat treatments.--To prepare precooked tuna in the laboratory, the authors cut 100-gram samples of frozen raw tuna loin, thawed them, and ground them in a mortar and pestle with additions of 200 ml. of nicotinamide or 0.1 normal sodium hydroxide solution at a minimum of pH 8. These 100-gram portions were formed into patties, wrapped in aluminum foil, and cooked in water at

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ABSTRACTER: Martin Heerdt

3.6 SOME RECENT WORK ON DEHYDRATION IN THE UNTIED KINGDOM

Gooding, D. G. V. and Rolfe, E. J. (Ministry of Agriculture, Fisheries and Food Research, Aberdeen, Scotland)
Food Technology 11, 302-306 (June 1957)

Progress in the dehydration of various types of foods including fish has been reviewed. Work on the dehydration of foods other than fish is merely outlined below, whereas work on the dehydration of fish is presented in detail.

Vegetables and fruit.--Recent studies were concerned with: (1) compression of vegetables, (2) comparison of steam and water scalding, (3) quick cooking dehydrated vegetables, and (4) drying techniques.

Dehydration of animal products.--Recent studies were concerned with: (1) meat products prepared from cooked meats and raw meats, and (2) dehydration of fish products.

General.--Future problems that are considered include: (1) production of more attractive commodities such as steaks, chops, and fish fillets, (2) production of quick-cooking meals, (3) improvement in storage life of dehydrated foods, and (4) reduction in bulk.

Dehydration of raw fish fillets.--Vacuum contact plate (V.C.P.) equipment was originally designed for cod fillets that were (1) soaked in a solution of potassium carbonate, (2) dried to approximately 15 percent moisture, (3) compressed into blocks, and (4) dried further to 5 percent moisture.

The resulting product was unattractive in color and flavor, required about 16 hours to rehydrate, and had a rubbery and slimy texture owing to alkali pretreatment. Quality was improved by replacing the potassium carbonate pretreatment solution with a sodium bicarbonate pretreatment solution. Drying, however, remained irregular. Thin slices of fillets not in contact with both hot plates were incompletely dried. To overcome this difficulty, cod fillets were sliced to a predetermined thickness. Thin fillet areas were overlapped so that an even bed of fish was spread on the trays. Intimate

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ABSTRACTER: Martin Heerdt

ANTIBIOTICS FOR FISH

CANNED TUNA PIGMENT

CANNING PILCHARDS

RECENT DEHYDRATION STUDIES

3.331 (Cross Reference: 1.126, 8.59)

212° F. for 30 minutes. Chicken breast (100-gram samples) was treated similarly. For color restoration studies, 1- to 2-centimeter flakes of commercially precooked loins were exposed to air until completely devoid of pink color, loosely packed in 10-gram lots into clear glass vials (25 x 95 millimeters in size), and covered with hot, freshly boiled, distilled water. Additions, if used, were 0.05, 0.10, and 1.0 percent of nicotinamide alone or in combination with 0.10 to 1.0 percent of sodium ascorbate, cysteine, or sodium hydrosulfite. The vials were then screw-capped tightly and cooked for 15 minutes at 240° F.

Results.--These studies showed that the pigment responsible for the pink color of precooked and canned tuna was a hemochrome. Confirmation was obtained with spectral studies of commercial tuna preparations, laboratory heat treatments, and model systems, from which data are tabulated below. Tuna hemochrome appears to be derived from the reaction of the heme of myoglobin and residual hemoglobin with either denatured globin or nicotinamide or both. Proper addition of hemochrome-forming compounds and reducing agents will stabilize the pink pigment in canned tuna.

Visual ratings of hemochrome formation
(Plus sign(s) indicates degree of pinkness over unreduced blank)

Non-heme constituent	Reducing Agent					
	Sodium Hydrosulfite	Sodium Sulfite	Ascorbic Acid	Sodium Ascorbate	Glutathione	Cysteine
Nicotinamide	++++[1]	-	+	++[1]	+	+
Nicotinic Acid						
Buffered[2]	++[1]	-	-	±	±[1]	-
Unbuffered	-	-	-	-	-	-
DPN	±			±		
Nitrite	+[1]	-	+		++[1]	+++

[1] Absorption spectra obtained. [2] Phosphate buffer, pH 7.0.

3.12

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plate contact was obtained, but egress of moisture vapor from the central portion of the tray was inhibited. To overcome this difficulty the fillets were cut into 5-ounce portions and spread on the trays with channels between the portions. Compression and a second drying stage adversely affected texture, therefore the cod fillets were dried directly to 4.5 percent moisture. Eventually a product was obtained that would rehydrate in about 2 hours and was reasonably palatable.

To improve rehydration, the dehydrated fish could be puffed or given an open structure by the rapid evolution of water vapor from the super heated fish. This process caused some of the fillets to become expanded to a loosely connected series of fish myotomes. Chemical pretreatment was finally eliminated by freezing the fish raw and modifying the drying procedure. Frozen blocks of uniform thickness improved the efficiency of the V.C.P. equipment. At present, the fish blocks are freeze-dried for 2 hours between parallel plates, after which the temperature is raised to facilitate dehydration. Commercially, a plant is able to reduce fish fillets to 2 percent moisture in about 10 hours. The final product is very porous, equal in bulk to the initial material, and similar in appearance and properties to freeze-dried fish.

The shelf life of dehydrated foods is markedly affected at elevated temperatures by the moisture content of the food. Fish products with 3 percent moisture, however, will remain edible for 1 year at 37° C.; although appreciable deterioration will occur. The same product packed with an in-package desiccant showed little change after 15 months by which time the moisture content of the fish was less than 1 percent.

Dehydration of cooked fish fillets.--Dehydrated precooked fillets, if prepared by the procedure outlined for raw fish, will yield a product that rehydrates almost instantaneously and has an appearance, flavor, and texture similar to cooked fresh cod. If the cooked fillets are minced before they are dried, a shredded fish product is obtained. This product may be mixed with mashed potato powder and seasonings to yield an instant fish-cake mix.

Cooked shrimp that have been shelled and deveined may be dried according to the V.C.P. method to obtain a product that rehydrates in less than 1 minute in cold water. The texture and flavor of these rehydrated shrimp is very similar to the original fresh shrimp.

Thirty-eight references are cited.

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of pilchards at a time. As the pilchards come into contact with plough-shaped baffles attached to the cylinder, they rub against one another and lose their scales. At the same time, sprays of water cleanse the pilchards and wash away the scales through an opening in the cylinder. Scaled pilchards are unloaded from the scaler by centrifugal motion through a spring-loaded door. Then they are immersed immediately and held for 20 minutes in tanks containing a 40 percent brine made from salt without calcium or sulphates. Fish, upon removal from the brine, are placed in baskets, washed in clear water, drained, and transported to the packing tables.

Packing.--Pilchards are packed by women into 6-ounce tall, 15-ounce tall, 7-ounce oval, and 14-ounce oval cans by alternating tails to the center and heads outward with the silver belly always upward. After leaving the packing tables the cans full of pilchards are conveyed through a steam heated enclosure maintained at 200° F. for 10 minutes and then allowed to cool for 20 minutes before they are placed by hand in a special draining machine. This drainer inverts the open cans at the rate of 50 cans per minute onto a stainless steel woven wire belt which allows the oil and liquid that exuded from the fish to drain away. The cans are discharged from the drainer right side up on to a conveyor belt which carries them to an automatic tomato-sauce filler. As the cans pass a point on the conveyor they contact a trip lever on a reservoir which adds the correct amount of sauce. After a final visual examination, covers are clamped on the cans, and they enter an exhaust box. They remain in this box for 13 minutes at 190° to 195° F. so that the contents of each can is raised to 180° F. before the can enters the high speed seamer which seals on the lids. The cans are then sealed, spray washed to insure that they are clean, placed in wire baskets, processed in a retort at a temperature of 240° F. for 60 minutes or more, and pressure cooled in the retorts to about 130° F. Canned pilchards are held for about 30 days to enable the tomato sauce to penetrate into the flesh.

3.338 CANNING CONTAINERS -- GLASS

Gray, B. H.
Food Technology in Australia 8, p. 9 (Jan. 1956) (Sydney, Australia)
World Fisheries Abstracts 8, 39-40 (May-June 1957)

The outstanding virtue of glass for packaging purposes is its purity. It gives nothing and takes nothing from the food product. It is resistant to rust, tarnish and disintegration and with ordinary wear and tear it is leakproof. A further marked advantage of glass packaging is the visual identification of the contents by the packer and by the purchaser.

The design of the glass container is of great importance from the glass manufacturers', the packers',and the consumers' viewpoints. The manufacturer should not be called upon to make something beyond his scope. The ideal container for ease of manufacture and for strength should be round or as near to round as possible. The heavy factory treatment which the glass container receives demands simple design--a container that is easily washed, labeled, packed and capped. Round bottles are ideal for modern continuous flow methods. From the point of view of the housewife an ideal package is one that: (1) protects the contents from deterioration; (2) enables her to see what she is buying; (3) opens easily; (4) closes tightly for storage; (5) is convenient to handle, carry and store; (6) is stable and won't tip over easily; (7) is honest in size in relation to its contents; (8) has proper and adequate information on its label and cover; (9) is not of odd weight, awkwardly shaped or inconvenient or difficult to extract the contents; and (10) is not unnecessarily elaborate.

Specification for glass containers should include details of the product to be packed, its sensitivity to light rays, the capacity of the container and, if the product is packed by weight, the specific gravity of the product; whether the product is pasteurized or sterilized after packaging; the type of closure, screw cap or vacuum cap, and the type of liner fitted to the cap. The supplier should be able

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 ABSTRACTER: R. Spencer

4.11 FISH OIL RESEARCH AT THE HORMEL INSTITUTE

Lundberg, W. O. (Hormel Institute, University of Minnesota, Austin)
Commercial Fisheries Review (Technology Supplement) 19, No. 4a, 5-8 (April 1957)

The Hormel Institute is a research branch of the Graduate School of the University of Minnesota located in Austin, Minnesota. The Institute, currently, is carrying on several projects in the research program started by the U. S. Fish and Wildlife Service with funds obtained through the Saltonstall-Kennedy Act. The three original projects begun in 1955 were concerned with (1) determining the structures of fish-oil fatty acids and developing an analytical method for the determination of the fatty acid composition of fish oils, (2) studying the chemistry of the odor problem in fish oils, and (3) studying the fractionation of fish-oil fatty acids by means of "inclusion" compounds. The third of these projects has been completed and now has been replaced by a fourth: a study of chemical reactions of fish-oil fatty acids.

Structure and analysis of fish-oil fatty acids. --It has been established that the more unsaturated fatty acids of land-animal and vegetable fats have a methylene-interrupted type of unsaturation; that is, $-CH_2-$ group lies between successive double bonds in the carbon chain. A $-CH_2-$ group between two double bonds is highly reactive. This characteristic in unsaturated fatty acids is exploited in the manufacture of commercially important derivatives of vegetable oils, particularly in the field of protective coatings.

Reports of various past studies have indicated that ethylene groups, $-CH_2-CH_2-$, rather than methylene groups separate the double bond systems of fish-oil fatty acids. This characteristic, if true, would be unfortunate because the ethylene-interrupted type of structure is far less reactive than is the methylene-interrupted type.

Investigations at the Hormel Institute, however, have unequivocally established the predominance of methylene-interrupted unsaturation in menhaden oil fatty acids. The investigators on this

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 ABSTRACTER: Kathryn L. Osterhaug

4.0 23RD ANNUAL REVIEW OF THE LITERATURE ON FATS, OILS, AND DETERGENTS. II.

Piskur, M. M. (Swift and Co., Chicago 9, Illinois)
The Journal of the American Oil Chemists' Society 34, 264-293 (June 1957)

Nutrition and biochemistry. --Studies on the nutritive value of whale oils have shown that: the original and hydrogenated oils were better than the methyl esters; sperm whale oil causes a seborrhea in rats similar to that obtained with diets containing oxidized soybean oil; and the nutritive value of nickel catalyzed hydrogenated oil is improved by adding ethyl linoleate (Fujii--Repts. Japan Marine Products Co. Res. Lab. No. 7, 18, 23, 28).

Characteristics and composition. --In perch there is a high correlation between fat and water content of the edible part that can be used for analytical purposes (Brandes & Dietrick--Fette-Seifen-Anstrichmittel 63, 433). The vitamins of fish oils have been reviewed with regard to origin and biological variations (Creac'h--Oleagineaux 10, 801).

The validity of the correction procedure of the British pharmacopoeial spectrophotometric method for determination of vitamin A in fish oils was confirmed by chromatographic separation tests (Balasundaram et al. --J. Sci. Ind. Res. 15C, 23). The fish liver oil vitamin A containted an average of about 25 percent neo-vitamin A_1 and 10 percent vitamin A_2. The tocopherol and vitamin A content of many marine blubber oils have been recorded (Heller--Univ. Microfilms, Ann Arbor, Mich. Publ. No. 15601, 28 pp.).

The periodic method gives abnormally high values with monoglycerides made from fish liver oils, possibly due to oxidation of vitamins A and E, and of double bonds of the highly unsaturated fatty acids (Perez & Molero--Grasas y aceites, Spain 6, 135). Urea adduct fractionation in combination with determination of several characteristics of the fractions was utilized for analyses of the composition of Indian shark liver oils, and mixtures of oleic, elaidic, linoleic, and saturated acids (Mehta et al. --J. Indian Chem. Soc. Ind. & News Ed. 19, 1). In tests on isomerization of cuttle fish oil with

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 ABSTRACTER: Martin Heerdt

4.23 NEW PRODUCTS FROM FISH OILS PART III. PREPARATION AND SEPARATION OF FATTY ALCOHOLS MADE FROM FISH OILS--A PRELIMINARY STUDY

Gruger, Edward H., Jr. (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review (Technology Supplement) 19, No. 4a, 13-17 (April 1957)

The reason for studying fatty alcohols is that they are extremely valuable in organic research due to the wide variety of other compounds that can be made from them. Esterification, oxidation or catalytic dehydrogenation to aldehydes, dehydration to unsaturated hydrocarbons, and halogenation to alkyl halides are some of the possible reactions of primary aliphatic alcohols. Alkyl halides formed from fatty alcohols also act as important intermediates in the synthesis of other compounds. The formation of various esters, aldehydes, and alkyl halides offers the greatest potentialities for fatty alcohols with respect to chemical synthesis of new products or the modification of older established products.

Because unsaturated alcohols of high molecular weight are difficult to prepare in a state of high purity, few reliable constants for such compounds have been reported in the literature. Work carried out at the Seattle laboratory of the U. S. Fish and Wildlife Service was designed to develop a satisfactory method of isolating pure polyunsaturated fatty alcohols and establish reliable constants for these alcohols.

Preparation of fatty alcohols. --Long-chain fatty alcohols were prepared by the sodium reduction of methyl palmitate, methyl stearate, methyl oleate and the natural glycerides of menhaden and pilchard oils. The resulting prepared fatty alcohols were then fractionated into saturated and unsaturated alcohols by acetone crystallization at low temperature.

A complex mixture of unsaturated alcohols prepared from pilchard oil was used in studies of the efficiency of various separation methods. The methods studied were fractional distillation, urea

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 ABSTRACTER: Kathryn L. Osterhaug

GLASS CONTAINERS FOR FOOD

23RD ANNUAL REVIEW OF OILS

FISH OIL RESEARCH

CHEMISTRY OF FISH OILS

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potassium hydroxide-glycol solutions, the absorption coefficients greater than 2900 A were increased and those lower than 2900 A were decreased with increasing concentration of potassium hydroxide (Oikawa--Sci. & Crime Detection, Japan 8, No. 3, 58). Feeding fish meal to pigs induces an unusually high content of the unsaturated fatty acids into the lard (Diller-Fette-Seifen-Anstrichmittel 58, 263).

In the Indian Waghbeer shark liver oil, C_{20} and C_{22} acids predominate over C_{18} and C_{16} acids; whereas in Khada muski shark liver oil, C_{18} acids constitute the major portion (Kamath & Magar--J. Indian Chem. Soc. 32, 455). The wax alcohols of sea anemones predominate in C_{16}, C_{20} and C_{22} alcohols (Bergman et al.--J. Org. Chem. 21, 720). The lipides of the blood of northern pike caught in an Alaskan lake are: total fatty acids 771, sterols 183, and phospholipides 411 mg. per 100 ml. (Wilber--Trans. Am. Fisheries Soc. 83, 150). The vitamin A component of sei whale liver oil seems to have six or more conjugated double bonds (Tsuchiya & Tanaka--Repts. Govt. Chem. Ind. Res. Inst. Tokyo 50, 367).

The so-called hitodestrol of shell fish and crustaceans was shown to be identical with α-spinasterol (Toyama & Takagi--Bull. Chem. Soc. Japan 28, 469). The 24-methylenecholesterol of mollusc lipides has been isolated, converted to several derivatives and all were characterized (Fagerlund & Idler--J. Org. Chem. 21, 372). The squalene content of the unsaponifiable of Centrophorus granulosus liver oil has been determined chromatographically and by distillation (Romos-Ayerbe & Romero--Grasas y aceites, Spain 6, 141).

Soaps and detergents. -- Hard odorless soap was made from low-grade marine animal fats by Twitchell splitting, bleaching the free acids with earth and active carbon and saponifying with anhydrous molten alkalies at 300 to 350° (Appuhn--U.S. 2,739,163). Sperm whale oil was used to make soap suitable for laundering in sea water by hydrogenation and used as 30 percent of the stock with coconut oil making up the major portion of other fats (Zaliopo & Baranov--Masloboino-Zhirovaya Prom. 21, No. 1, 18).

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countercurrent distribution, and column chromatography. Ultraviolet spectrophotometry was used to measure qualitatively the degree of unsaturation in the various fatty-alcohol fractions.

The data in table 1 show iodine numbers and refractive indices of the distilled fractions.

Table 1. Analytical data for alcohol fractions obtained by fractional distillation

Fraction[1/]	Boiling Point		Refractive Index	Iodine Number	Hydroxyl Equivalent[2/]
	Temperature	Pressure			
No.	°C.	Mm. Hg.	n_D^{30}		
1	113.0-126.0	0.50	1.4458	26.6	234.6
3	139.0-141.0	0.50	1.4562	104.0	252.8
9	163.0-165.0	0.51	1.4620	132.5	277.2
11	167.0-170.0	0.63	1.4630	134.2	290.0
12	170.0-172.0	0.50	1.4611	131.4	285.0
17	187.0-189.0	0.60	1.4843	198.2	311.8
18	189.0-191.0	0.65	1.4899	216.4	311.7
21	204.0-208.0	0.65	1.4960	199.8	329.9
22	208.0-210.0	0.65	1.4980	222.9	348.3

1/ These are the major fractions that appeared to contain nearly pure compounds.
2/ Theoretical molecular weights of saturated alcohols are as follows: C_{16}, 242; C_{18}, 270; C_{20}, 298; C_{22}, 326; C_{24}, 354.

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to inspect the filling and sealing machinery.

In the handling of glass containers, care should be taken to prevent thermal shock. If a hot product is being packed, the containers should be pre-warmed. Also, to reduce free alkali and extraneous dirt, the glass containers should at least be rinsed before reaching the filling machine.

The present trend is towards vacuum sealing of food products. The main source of trouble with vacuum sealing is insufficient control of headspace. Once the headspace has been decided upon, it should be carefully controlled. Vacuum caps with compound gaskets or rubber rings should be stored in a cool, dark, dust-free room. It is inadvisable to rely on manual application of screw caps. If fully mechanical application is impossible, a cap tightener should be used.

Colored, ceramic lettering is on the increase and has more advantages over labeling, particularly where the container has a long re-use life.

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project are now concentrating on the isolation of individual polyunsaturated fatty acids from menhaden oil for complete structural determination and to establish analytical constants to be used in the analysis of all common fish oils.

Chemistry of the odor problem. -- The typical odor of fish oils is a deterrent to their use in many applications. Although fish oils can be steam deodorized, objectionable odors return within a relatively short time. Evidence indicates that the returning odor may stem from two sources: (1) a liberation of nitrogenous compounds of low molecular weight from proteins or other nitrogenous materials of higher molecular weight, and (2) the development of substances of low molecular weight by reaction of atmospheric oxygen with highly unsaturated fatty acids.

The obvious approach to this problem is to find out what these compounds are and how they are formed. This information will constitute a basis for devising means to prevent their formation or to neutralize them as they form.

Studies to date indicate that the odor and flavor components to a considerable extent consist of unsaturated carbonyl and dicarbonyl compounds derived primarily from the more unsaturated fatty acids. If it can be established that the undesireable odors can be attributed predominantly to one type of compound, there is a good possibility that additives can be found that will react with and destroy the odor components.

Separation of fatty acids by means of inclusion compounds. -- Fatty acids have the peculiar property of forming solid complexes or "inclusion" compounds with materials like urea. Investigators at the Hormel Institute devoted efforts to finding materials other than urea that might be employed in such separations. In the course of the investigations it was found that thiourea is effective in removing peroxides from fish oils. This information may be of value in the study of the odor problem. It was also found that deoxycholic acid inclusion compounds of fish-oil fatty acids can be separated readily by paper chromatography. This finding will be useful in establishing the purity of the individual fish-oil fatty acids that are prepared in the project on structure and analysis of fish-oil fatty acids. It also has been applied to show that the content of fatty acids of different chain lengths in menhaden oil are quite different from the value published heretofore.

4.21 OXIDATIVE DETERIORATION IN FISH AND FISHERY PRODUCTS
PART I. INTRODUCTION

Stansby, M. E. (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review (Technology Supplement) 19, 24-26 (May 1957)

Spontaneous oxidation of fish oils is the cause of extensive deterioration in the quality of many fishery products. The oxidation of the oils and associated pigments in fish causes rancidity and discoloration in fresh, canned, preserved, and frozen fish. Oxidation of the oil remaining in fish meal causes heating of the meal, and certain, so-far unidentified reactions, take place that seem to impair the nutritive value of the meal. Oxidation of rendered fish oils alter their properties and produce off-odors.

A collaborative program to investigate various aspects of the oxidation problem is under way between the U. S. Fish and Wildlife Service and the University of California Department of Food Technology. The program is concerned principally with the following four fields of study: (1) the mechanism of the oxidation of the oil in fish tissue; (2) the reaction between fish oil and protein while in fish tissue or fish meal; (3) oxidation of extracted fish oil; and (4) the oxidation of tuna pigments.

Oxidation mechanism in fish tissue.--The results of laboratory investigations indicate that the hematin pigments of blood are important catalysts accelerating the oxidation of oil in fish tissue. It has been shown that oil oxidizes much more rapidly in the areas of fish tissue where the hematin pigments are concentrated.

Fish oil-protein reaction.--The reaction between oil, oxygen, and protein in fish results in such phenomena as rusting in frozen fish and darkening of the color of fish meal. The mechanism of this

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 ABSTRACTER: Kathryn L. Osterhaug

4.21 OXIDATIVE DETERIORATION IN FISH AND FISHERY PRODUCTS
PART 2. PROGRESS ON STUDIES CONCERNING MECHANISM
OF OXIDATION OF OIL IN FISH TISSUE

Brown, W. D.; Venolia, A. W.; Tappel, A. L.; Olcott, H. S. (University of California, Davis); and Stansby, M. E. (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review (Technology Supplement) 19, 27-31 (May 1957)

The mechanism of the oxidation of fish oils while they are in contact with fish tissue is different from that of the extracted oil. Hematin has been found to be a powerful biocatalyst for oil oxidation in foods other than fish.

Hematin catalyses.--In nine species of fish analyzed, the hematin compounds were found to vary in amount from 5.4×10^{-5} M in pilchard down to 0.1×10^{-5} M in cod. The catalytic effect of the hematins of fish flesh on the oxidation of oil was determined by measuring the oxygen uptake of a salt of an unsaturated fatty acid, ammonium linoleate, when shaken in a Warburg respirometer. The results of these experiments showed a direct correlation between the hematin-compound content of the various species of fish and the catalytic effect on the linoleate oxidation. The rate of oxidation of the fish tissue also was correlated with the content of hematin compounds.

Role of antioxidants.--Various combinations of antioxidants were developed for application in retarding the oxidation of oil in fish tissue. Some of these combinations were far more effective than were the usual antioxidants used alone or with a single synergist. For instance, a mixture of tocopherol, ascorbic acid, and citric acid was about 80 times as effective as was ascorbic acid used alone or in mixtures of ascorbic and citric acids.

The rate of oxygen adsorption in fish meals was measured. Certain commercial antioxidants

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 ABSTRACTER: Kathryn L. Osterhaug

4.21 OXIDATIVE DETERIORATION IN FISH AND FISHERY PRODUCTS
PART 3. PROGRESS ON INVESTIGATIONS CONCERNING REACTIONS
RESULTING IN BROWN DISCOLORATION

Venolia, A. W.; Tappel, A. L. (University of California, Davis); and Stansby, M. E. (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review (Technology Supplement) 19, 32-34 (May 1957)

The development of brown discoloration in fish and fishery products has long plagued the fish processing industry. Canned, frozen, and dehydrated fish and fish meal are all affected to some extent by this phenomenon.

Work is currently underway to investigate the mechanism of production of brown colors in fish (1) by a reaction between oxidized fish oil and proteins, (2) by oxidation or polymerization of fish oils, and (3) by a combination of these general types of reactions.

Experimental.--Model systems were used to determine the general types of reactions involved. In these initial experiments, it was found that emulsions of menhaden oil and protein invariably reacted to form a deep brown color. This established that the presence of carbohydrate is not necessary as it is in the Maillard reaction.

A number of different reactions have been shown to be involved in the development of these brown colors. These reactions include (1) those between oil and protein at the carbonyl and amino groups, (2) oxypolymerization, and (3) oxidation of unsaturated oils.

Experiments were also set up to investigate the effect of conditions that might favor or retard

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 ABSTRACTER: Kathryn L. Osterhaug

4.21 OXIDATIVE DETERIORATION IN FISH AND FISHERY PRODUCTS.
PART 4. PROGRESS ON STUDIES CONCERNING OXIDATION OF
EXTRACTED OILS

Einset, E. (Fishery Products Laboratory, Ketchikan, Alaska); Olcott, H. S. (Institute of Marine Resources, University of California, Berkeley); and Stansby, M. E. (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review (Technology Supplement) 19, 35-37 (May 1957)

When oil is extracted from fish tissue, it may behave quite differently from the way it does while still a part of the tissue. This is because the extracted oil is no longer in contact with such tissue constituents as protein and hematin compounds which can modify the oxidation process. In addition, any heating of the oil during processing may destroy antioxidants or prooxidants that might otherwise have altered the oxidation pattern of the oil. A program is in progress to investigate the oxidation of extracted fish oils.

The first phase of the program is designed to obtain a better understanding of the oxidation of commercially produced fish oils and of some laboratory-extracted oils from species of fish not generally used commercially. Information on the chemical behavior of such extracted oils, when combined with that on the behavior of oils in fish tissue, will give a better insight into the role of the biocatalysts present in the tissue during the course of fish oil oxidation.

Oxidation rate of extracted fish oils.--The rate of oxidation of a number of fish oils was compared with their tocopherol content (see table 1, over). A comparison was also made of the stability of various fish oils with their iodine number and their tocopherol content (see table 2, over). These preliminary experiments indicate an inverse correlation between the rate of autoxidation of various

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OXIDATIVE DETERIORATION

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were found to be effective in retarding oxidation. The thoroughness of mixing the antioxidant with the meal was found to have considerable influence on the effectiveness of the antioxidant.

Table 1 - Oxidation Rate of Cubes of Light and Dark Meat of Fish in a Warburg Apparatus at 0° C.

Species	Rate of Oxidation	
	Light Meat	Dark Meat
	Microliters of Oxygen Uptake Per Hour Per Gram	
Chum salmon	0	17
Pink salmon	0	13
Tuna	0	13
Sheepshead	0.4	1.5
Lake chub	0.6	1/
Pilchard	7	1/
Rockfish	1	1/
Cod	0.5	1/
Mackerel	8	1/

1/ For these species, no separation of light and dark meat was attempted. The cubes of meat used, however, were mostly light meat.

Table 4 - Oxidation Rate of Tuna Meal 1/ Protected by Various Antioxidants

Antioxidant	Oxidation Rate of Tuna Meal
	Microliters Per Hour Per Gram
Santoquin	3.0
DPPD	3.8
BHA	5.8
BHT	6.7
Propyl gallate	17.0
NDGA	22.0
None (control)	27.5

1/ Yellowfin-albacore mixture.

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Table 1 - Properties of Extracted Oils

Oil	Rate of Oxidation of Oil		Total Tocopherol Content of Oil	
	Original	Oxidized	Original	Oxidized
	μl. Oxygen Per Hr. Per Gram		μg. Per Gram of Oil	
Sheepshead	279	194	27	3
Mountain trout	14	36	46	35
Pink salmon	7	40	101	0
Lake chub	4	39	297	58
Commercial tuna 1/	113	188	112	43

1/ Species unknown, probably mixed skipjack and yellowfin.

Table 2 - Comparison of Stability of Fish Oils with Iodine Number and Tocopherol Content

Oil	Induction Period at 50° C.	Iodine No.	Tocopherol Content
	Hours		Mg./Kg.
Sardine	6	199	40
Menhaden	9	167	66
Tuna	36	185	159
Herring	45	142	142
Pink salmon	48	164	217
Whale	93	161	198
Sablefish	136	99	628

fish oils and their content of tocopherols. Treatment that tended to destroy the tocopherols also accelerated autoxidation. Also noted was a positive correlation between the rate of oxidation and the iodine number of the oils.

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reaction has been investigated, and it has been found that two types of reactions are involved: oil oxidation and the carbonylamine reaction. Evidence has been obtained to show that the former reaction predominates and that factors influencing oxidation are of primary importance in retarding this oil-protein reaction.

Oxidation of extracted oils. --An investigation is in progress regarding the antioxidant role of naturally occurring tocopherols in extracted fish oils. Tocopherols occur in small concentrations in all of the fish oils that have been studied. The presence of these naturally occurring tocopherols may play an important role in determining the stability of fish oils.

Pigment changes in tuna. -- It has been demonstrated that the normal changes in the color of tuna results from a series of oxidation reactions of the hematin of blood and muscle pigments and that, under suitable conditions, the reactions are reversible. The formation of desirable pink color in the canned product is favored by the presence of both reducing conditions and of nicotinamide.

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the protein-oil reaction or the oil-oxidation reaction. It was found that both antioxidants (NDGA, BHT, Santoquin) and prooxidants (cupric ion, hemoglobin, oxygen) diminished the rate of browning. An increased rate of browning occurred only when the active carbonyl amine reaction was blocked by acetylation to make the protein amine groups inaccessible, or when carbonyl groups were made unavailable by treatment with sulfite ion.

Tentative hypothesis. -- Although this work has not been completed, a tentative hypothesis has been drawn up to account for these observations. The following reactions are postulated as competing to some extent for the available reactants: (1) active carbonyl amine browning, yielding a more lightly colored product than that from (2), (2) unsaturated lipid oxypolymerization, and (3) rapid unsaturated lipid oxidation, also yielding a lighter colored product than from (2). Treatment of emulsions to block active carbonyl amine browning favors reaction (2) with the resulting augmented development of color. Antioxidants block reactions (2) and (3), whereas prooxidants divert reactants from (1) and (2); and thus both types of treatment diminish the rate of color development.

4.29 NEW PRODUCTS FROM FISH OILS PART IV. PRELIMINARY INVESTIGATIONS ON ALKYL HALIDES, SILICONES, AND QUATERNARY AMMONIUM SALTS

Gruger, Edward H., Jr. (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review (Technology Supplement) 19, 18-23 (April 1957)

Fish oils are known to be unique in containing a high percentage of long-chain fatty acids with many double bonds. These unique properties of fish oils make them potentially valuable for the manufacture of many industrial and pharmaceutical products.

Polyunsaturated fatty alcohols have been prepared from fish oils and are being used as the starting material in the preparation of other derivatives. Polyamino fatty acids, alkyl halides, silicones and quaternary ammonium salts are the compounds of current interest to the fish oil research project at the U. S. Fish and Wildlife Service in Seattle.

Alkyl halides.--The alkyl halides prepared from fish oils are the products of direct reaction of the fatty alcohols with the appropriate halogenating agent. These compounds have numerous applications. Employed in various coupling reactions, they are used to prepare long-chain hydrocarbons. Alkyl magnesium halides, known as Grignard reagents, offer a means of producing many useful compounds such as silicones, primary alcohols, substituted secondary and tertiary alcohols, ketones, and sulfinic acids. Alkyl halides also are useful in undergoing displacement reactions to form compounds such as nitrites, ethers, and mercaptans. Each of these products has great potential utility.

Silicones.--A silicone has been defined as "a compound containing the elements of silicon, oxygen, and organic groups, the silicon being present in sufficient amount to affect the properties measurably".

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 ABSTRACTER: Kathryn L. Osterhaug

4.82 FEEDING FISH OILS TO DOMESTIC ANIMALS

Oldfield, J. E.; Anglemier, Allen F.; (Oregon State College, Corvallis); and Stansby, M. E. (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review (Technology Supplement) 19, 11-12 (April 1957)

In recent years, the increasing use of animal fats as a major source of energy in the diets of farm animals has suggested that marine oils might also be used successfully for the same purpose. Knowledge of the effects of fish oils in the rations of domestic animals is very limited.

Two important questions were studied in the fish-oil feeding investigations: (1) what is the most effective level at which fish oils can be fed; and (2) how do different fish oils compare in their value as feed supplements? A program to supply information regarding these questions, supported by funds from the Saltonstall-Kennedy Act of 1954, was conducted at Oregon State College under the general supervision of the U. S. Fish and Wildlife Service at Seattle, Washington.

Experimental.--In the experiments, swine from the Berkshire herd of the Oregon Agricultural Experimental Station were housed in individual feeding pens so that it was possible to keep accurate feed and performance records on each animal throughout the test period.

The following criteria had to be considered in evaluating fish oils as additives to swine feeds: (1) the rate of gain of the animals fed had to be checked to ensure that the oil-containing rations produced at least as rapid gains as did the non-oil-containing rations, (2) the efficiency of conversion of the feed to pork had to be proved satisfactory, and (3) the end product of the feeding (hog carcass) had to be acceptable from a market point of view.

Two feeding trials were set up involving 16 pigs each--four pigs were allotted to each of the four

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 ABSTRACTER: Kathryn L. Osterhaug

4.63 THE USE OF VITAMIN A PROTECTED BY DIPHENYL-p-PHENYLENE-DIAMINE (DPPD) FOR THE GROWTH OF CHICKENS

Ascarelli, I. (Hebrew University, Rehovot, Israel)
Poultry Science 36, 549-551 (May 1957)

The purpose of this experiment was to learn (1) if a coated (dry stabilized) vitamin A is more stable as a diet supplement than a vitamin A fish oil and (2) if the coating affects the utilization of stabilized vitamin A. A dry coated vitamin A concentrate and a vitamin A fish oil were fed as sources of vitamin A, both without and with DPPD.

Experimental.--One-day old S. C. White Leghorn chickens housed in wire-floored battery brooders were weighed individually when 1 day, 1 week, and 2 weeks old and divided into groups of 50 on the basis of their weight at 1 week of age. At 4 weeks of age the chickens were further divided into sub-groups according to sex, and at 5 weeks of age they were transferred to an outdoor growing house. The percentage compositions of the basal diet was as follows: ground barley 15, ground white corn 25.25, wheat bran 20, peanut meal 20, dried skim-milk 5, South African fish meal 7.5, alfalfa hay meal (carotene free) 4, ground oyster shell 2, dibasic calcium phosphate 0.75, and manganized salt 0.5. This diet was supplemented with 100 international units (I.U.) of vitamin D_3 per 100 grams, 3 grams of riboflavin per ton, 11 grams of calcium pantothenate per ton, and 5 milligrams of vitamin B_{12} per ton.

Experimental feeding.--The first two weeks served as a depletion period during which the chickens received only the basal diet. Vitamin A without and with DPPD was added to the basal diet at the rate of 300 I.U. per gram during the third and fourth weeks and at the rate of 400 I.U. per gram thereafter. The vitamin A materials used as supplements were as follows: (1) fish liver alone, (2) fish liver oil plus 0.0125 percent DPPD, (3) stabilized concentrate alone, (4) stabilized concentrate plus 0.0125 percent DPPD. All four diets were fed ad libitum. To avoid the loss of vitamin A, only a 1 week supply of feed was mixed in advance. Chickens were weighed in groups at weekly intervals and individually

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 ABSTRACTER: Martin Heerdt

6.133 ENZYMES AS AN AID IN SEPARATING OIL FROM PROTEIN IN SALMON EGGS

Kyte, Robert M. (Fishery Products Laboratory, Ketchikan, Alaska)
Commercial Fisheries Review (Technology Supplement) 19, 30-34 (April 1957)

That the oil from salmon eggs is very unsaturated is indicated by the fact that its iodine number is over 200. Oil from this source contains significant amounts of both cholestrol and phospholipides. These characteristics may be of considerable economic importance. The double bonds in the unsaturated salmon-egg oil make this oil particularly useful for the synthesis of polymers and highly substituted compounds as well as for use as reactive intermediates in the synthesis of other organic compounds.

Analyses of the amount and distribution of the ten essential amino acids in the protein of salmon eggs indicated that salmon-egg protein would be a valuable constituent of animal feed.

Several methods are available for separating the oil from the protein of fishery products, but each has been found to have certain limitations. None of the processes have been found completely satisfactory for use with salmon eggs.

Based on the experience of other investigators in their work on egg yolk and stickwater, experiments utilizing protein-digesting enzymes were outlined for use on salmon eggs.

Experimental enzyme digestion.--The action of a number of proteolytic enzymes on salmon eggs was investigated. Conditions of pH and temperature reported to be within the active range of the enzymes were maintained and the rates of solubilizing the protein and liberating the oil were observed. The general pattern of action was the formation of a clear protein solution, a free oil, and oil emulsion layer, and, in some cases, a small amount of sediment. Figure 3 (see over) shows the rate of formation of clear solution from salmon eggs using pepsin (N.F. grade), Rhozyme B-6 and Rhozyme A-4 (commercial proteolytic enzymes) and Bromelain (a mixture of several proteolytic enzymes obtained from the stem of the pineapple plant). Bacterial action was inhibited by the addition of 20 p.p.m.

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 ABSTRACTER: Kathryn L. Osterhaug

CHEMICALS FROM FISH OILS

VITAMIN A ANTIOXIDANT

FISH OILS FOR SWINE

PRODUCTION OF SALMON EGG OIL

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at the end of the 10 week experimental period. A number of chickens chosen at random at the beginning of the experiment were sacrificed at the rate of several chickens every two weeks, and the vitamin A content of their livers was determined.

Results.--Tables 1 and 2 below show respectively, average weights and average vitamin A liver storage for chickens maintained on the four diets. Chickens on the stabilized concentrate showed an improvement in weight that just reached the significant level (table 1) and a large superiority in liver vitamin A storage. Stabilized vitamin A appears to be subject to less destruction during digestion than fish liver oil as a source of vitamin A. Of the four comparisons available three were in favor of chickens on diets that did not contain DPPD.

Table 1. Average weights of chickens at 4, 6, 8, and 10 weeks.

Supplement	F.O.[1]		F.O. + DPPD		S.C.[2]		S.C. + DPPD	
Age, weeks	Male	Female	Male	Female	Male	Female	Male	Female
4	249	224	237	202	258	233	246	226
6	428	355	383	320	439	379	394	359
8	621	549	597	484	659	559	578	528
10	800	730	826	667	910	762	818	724

[1] F.O. = Fish oil.
[2] S.C. = Stabilized concentrate.

Table 2. Average total vitamin A liver storage of chickens, in I.U.

Supplement	F.O.[1]		F.O. + DPPD		S.C.[2]		S.C. + DPPD	
Age, weeks	Male	Female	Male	Female	Male	Female	Male	Female
6	46	15	134	94	192	303	316	427

4.29 (Cross Reference: 4.80)

Silicones are quite stable at high temperatures, somewhat resistant to oxidation, and have good lubricating and water-repellent properties. Silicones that contain long-chain polyunsaturated alkyl groups would probably possess special properties with interesting potential uses. It is possible that a highly stable drying oil or a tough resilient copolymer might result from this type of silicone.

There are four commercial methods for preparing silicone compounds containing carbon. These methods are (1) the "direct process", (2) the Grignard method, (3) the olefin addition method, and (4) the sodium method. The Grignard method has been used at the Seattle laboratory. This method involves the substitution of an organic group for one or more of the chlorine atoms in silicone tetrachloride. In this way, compounds of the types $RSiCl_3$, R_2SiCl_2, R_3SiCl or R_4Si can be formed from $SiCl_4$. The R in these compounds represents a group such as the octadecyl group $(-CH_2(CH_2)_{16}CH_3)$.

The alkyl chlorosilanes, as they are called, have a marked reactivity toward compounds containing hydroxilic groups. By reacting alkyl chlorosilanes with water, for example, compounds called alkyl silanols can be formed. Low molecular weight compounds of this type have the ability to dehydrate readily to form silicon polymers or silicones. This property has potential value for the preparation of long-chain alkyl silanols and is being investigated.

Quaternary ammonium salts.--In connection with the work on alkyl halides, a derivative was sought for use in the identification of the various long-chain alkyl halides being synthesized. Quaternary ammonium salts were chosen because of their relative ease of formation and reasonably sharp melting points. (A sharp melting point does not necessarily indicate purity with these products.) These salts recently have become commercially important as germicides and as surface-active agents in the textile field. Their use has also been suggested in the production of disinfecting and preserving agents, detergents, fire-extinguisher foams, wetting agents, and flotation agents.

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of aureomycin (chlortetracycline hydrochloride).

Even though the protein solution of the enzyme digest was clear after centrifuging, 10 to 20 percent of the dry weight of the protein solution was oil (as determined by acid hydrolysis). A benzene or dichloroethane azeotropic distillation of the enzyme digest removed one-half to two-thirds of the oil but the dried residue still contained 6 to 8 percent oil.

The digestive tract of fish contains a variety of proleolytic enzymes that attack peptides and peptones as well as whole proteins. The enzyme system in the digestive tract of pink salmon effectively solubilized salmon egg protein and permitted an azeotropic distillation extraction to remove essentially all of the oil from the protein residue.

The digestion of salmon eggs by enzymes offers advantages in separating oil from protein, particularly in Alaska where the source of eggs is widely scattered and often in remote locations.

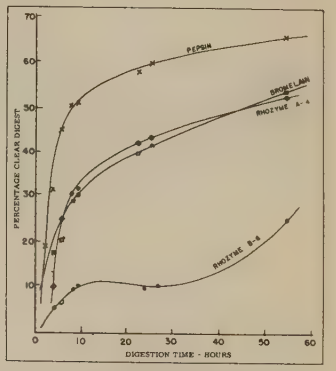

FIG. 3 - THE EFFECT OF DIGESTION TIME ON THE AMOUNT OF CLEAR DIGEST FORMED IN THE DIGESTION OF SALMON EGGS USING ONE PERCENT BY WEIGHT OF FOUR DIFFERENT ENZYMES.

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ration treatments that were under consideration. The duration of the feeding trials was from shortly after weaning until the pigs reached approximately 190 pounds or the normal growing-fattening period followed in farm practice.

In the first trial, California sardine oil replaced 5, 10, and 15 percent of the grain portion of the diets. In addition a non-oil-containing diet was fed as a check control. In the second trial, the oils in each case made up 5 percent of the total diet. One sample was crude menhaden oil, one was alkali-refined-and-bleached menhaden oil, and the third was polymerized (kettle-bodied) oil. Again, a non-oil-containing diet was fed as a check.

At the conclusion of the tests, all of the animals were slaughtered at a commercial packing house, carcass measurements were made, and samples were taken. A shoulder roast was cut out of each carcass and, after being cooked under standard controlled conditions, was subjected to taste testing by a panel.

Results and discussion.--In the first trial it was found that the pigs fed 5 or 10 percent California sardine-oil grew at about the same rate and at about the same feed efficiency as did those that were fed the check ration. When oil replaced 15 percent of the grain in the diet, the pigs went off feed and failed to grow properly. When the carcasses were evaluated, a fishy odor and taste were found to be present in the pigs fed all three levels of fish oil. A marked yellow color also was noted in the fat of the pigs on the 10 and 15 percent fish oil ration.

From this trial it was concluded that a 5-percent level of fish oil would be satisfactory in swine rations if something could be done to prevent the "fishiness" in the carcass.

In the second trial, it was found that pigs fed 5 percent of either crude or alkali washed menhaden oils gained weight at a faster rate than did the pigs on the control ration; whereas those fed the polymerized menhaden oil gained weight less quickly than did the controls. The carcass quality of the pigs fed the polymerized oil, however, was superior to that of the pigs fed either of the other types of oil and was similar to that of the controls. From this trial it seems possible that a fish oil polymerized under carefully controlled conditions might yield a product satisfactory from the nutritional as well as the carcass-quality standpoint.

6.133 TECHNICAL NOTE NO. 37. USE OF BACTERIAL CULTURE TO AID SEPARATION OF MENHADEN OIL IN GRAVITY TANKS

Kern, Jerome
Commercial Fisheries Review 19, 15-16 (May 1957)

Bacterial action that releases the oil from protein-oil emulsions and other non-specific complexes is useful for releasing menhaden oil from press liquor. The proteolytic action of the bacteria appears to be responsible for this release. The actual use of starter cultures to insure typical effective "break out" of oil is recommended.

In the processing of menhaden, the hot liquor pressed from the cooked fish--a complex mixture of oil, water, soluble fish-tissue compounds, and fine material escaping the screening process--is transferred to large holding tanks. On standing, the oil separates from the press liquor, rises to the surface, and produces a barrier that prevents air from getting into the lower level. Semi-anaerobic conditions are thus produced. During an 8- to 10-hour period a thick layer of foam is formed over the surface of the oil, indicating that a proper "break out" of oil has occurred.

Samples of press liquor or stickwater were removed from the tank at the completion of filling, one hour after filling, and at the completion of the process. Bacterial studies were made of these samples by preparing slides and examining them under the oil-immersion objective lens of the microscope.

Examination of the stained preparations revealed a relatively pure culture of large gram-positive bacilli, which occurred singly and contained a central oval spore located terminally. Preliminary investigation indicated that the organism is a member of the genus Clostridium. That the organism is probably of a proteolytic species is indicated by the fact that ammonia and other protein breakdown

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ABSTRACTER: Kathryn L. Osterhaug

6.14 BULK HANDLING OF ALASKA HERRING MEAL

Kyte, Robert M. (Fishery Products Laboratory, Ketchikan, Alaska)
Commercial Fisheries Review 19, 9-14 (May 1957)

Alaskan herring meal is produced in areas ranging from 700 to 1400 miles from Seattle, the United States port of entry for most of this product. The present practice is to sack the meal in burlap bags and ship it on barges that hold approximately 440 tons of meal.

A large proportion of the herring meal production is purchased by poultry-feed formulators who buy herring meal by the carload lot and who have facilities for bulk handling grain and other feed ingredients. Bulk handling the herring meal instead of sacking would offer savings to the manufacturer by eliminating the cost of sacks and the labor of sacking as well as by the simplification of warehousing and loading. Cost of handling at the port of entry would also be reduced because the costs of unloading, when using modern bulk-handling equipment, would be significantly less than the costs of unloading sacked meal.

Unfortunately, such savings to the manufacturer would be temporarily offset by the capital expense of new equipment necessary for bulk handling. Also, facilities different from those now being used for storing meal at the port of entry would be required.

This paper reports findings made during an initial investigation of the technology of bulk handling of herring meal.

The major problem in the bulk handling of herring meal was considered to be spontaneous heating during storage. The temperature of the meal was found to rise rapidly during the first two hours

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ABSTRACTER: Kathryn L. Osterhaug

6.190 VITAMIN CONTENT OF FISHERY BYPRODUCTS PART 3. RIBOFLAVIN NICOTINIC ACID, VITAMIN B_{12}, MOISTURE, OIL, ASH, AND PROTEIN CONTENT OF COMMERCIAL FISH MEALS

Karrick, Neva L.; Clegg, William; and Stansby, M. E. (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review (Technology Supplement) 19, 14-23 (May 1957)

Samples of commercial fish meals prepared from herring, mackerel, menhaden, sardine, and tuna were assayed for their content of riboflavin, nicotinic acid, vitamin B_{12}, protein, moisture, ash, and oil. The results of these assays are reported in six tables (see table 4, over).

As complete a history as possible was obtained for each sample of fish meal. The history, whenever possible, included the following information: (1) species of fish, (2) location of catch, (3) storage history of raw material, (4) condition of the raw material when processed, (5) portion of the fish processed, (6) methods used for cooking, pressing, and drying the raw material, and (7) storage history of the meal.

The samples of meal were assayed microbiologically for their content of riboflavin, nicotinic acid, and vitamin B_{12}. Riboflavin and nicotinic acid were determined by a modification of the method of Roberts and Snell (1946). Vitamin B_{12} was determined by a modification of the method of Hoffman, Stokstad, Hutchings, Dornbush, and Jukes (1949). In all of the assays, the samples were run in duplicate at four different concentrations, and the growth of the organism produced by the sample was measured by titration of the acid formed. The amount of vitamin present was determined by comparison with the growth produced by known amounts of the vitamin.

The content of protein, moisture, oil, and ash in the products was determined using standard techniques of the Association of Official Agricultural Chemists (1950).

See table, over.

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ABSTRACTER: Kathryn L. Osterhaug

6.190 NEW ENGLAND FISH MEALS IN THE NATIONAL FISH MEAL RESEARCH PROGRAM

Carver, Joseph H. (U. S. Fish and Wildlife Service, East Boston, Massachusetts)
Commercial Fisheries Review (Technology Supplement) 19, 10-13 (May 1957)

Fish meals made from ocean perch, herring (sardines), menhaden, and whiting, were collected by technologists from the U. S. Fish and Wildlife Service's East Boston laboratory for use in a nationwide research project. The samples obtained were representative of the production of the New England fishery byproducts manufacturer.

Pertinent data, including the history of the raw material used and the processing techniques employed, were obtained with each sample. The proximate composition (moisture, fat, protein, and ash content) was determined for each sample and the samples sent to contractors for further nutritional evaluation.

Table 1. (condensed) Data and Composition of [Commercial Scale] Meal Samples

Sample size	Species of Fish	Portions Used	Method	Proximate Composition			
				Moisture	Protein	Fat	Ash
Lbs.				(Percent)			
100	Ocean perch	Filleted fish frames with viscera	Cooked 4 min at 40 p.s.i. steam, pressed 5 min., and hot-air dried at 1400° to 1500°F.	6.3	63.3	11.4	22.4
100	Ocean perch			7.1	58.2	9.0	25.9
100	Ocean perch			6.2	58.7	9.5	26.1
100	Ocean perch		Cooked 4 min. at 40 p.s.i. steam, pressed 5 min., and dried in steam-jacketed drier 212° F.	7.6	61.5	8.2	21.7

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ABSTRACTER: Kathryn L. Osterhaug

OIL SEPARATION IN STICKWATER

BULK-HANDLING FISH MEAL

FISH MEAL ANALYSES

FISH MEAL SURVEY

after sacking and to continue to rise in some cases for 6 to 8 hours or more. Temperatures reached were as high as 168° F. The temperature of the unground scrap rose rapidly to around 225° F. during the first few minutes after it came out of the drier. These temperatures were measured 6 inches below the surface of a 2-foot pile of scrap.

The primary cause of heating is believed to be the oxidation of the oil retained in the meal. For this reason, a series of plant tests were conducted to determine the effectiveness of using an oil antioxidant to prevent the heating of bulk-stored herring meal.

Santoquin (6 ethoxy-1, 2-dihydro-2, 2, 4-trimethylquinoline) was used because of its effectiveness as an oil antioxidant. The addition of 0.01 percent of this antioxidant to fish meal in the form of an oil-in-water emulsion did not reduce the initial rate of heating significantly; it did, however, reduce the maximum temperature observed in the bulk-stored meal and the time required to reach this maximum temperature.

Dispersed herring oil held in contact with air for 4 hours and then cooled showed no further tendency toward spontaneous heating. If the oil in herring meal behaves in a similar manner, it is suggested that herring meal could be stored safely in bulk if it is allowed to go through its initial heating under controlled conditions before being placed in storage.

Table 1. (condensed) Data and Composition of [Commercial Scale] Meal Samples

Sample Size	Species of Fish	Portions Used	Method	Proximate Composition			
				Moisture	Protein	Fat	Ash
Lbs.				(Percent)			
2000	Ocean perch	Filleted fish	Cooked 4 min. at 40 p.s.i. steam, pressed 5 min. and hot-air dried at 1400° to 1500°F.	5.4	59.2	10.5	23.7
100	Ocean perch	frames with viscera	Cooked 4-5 min. at 50 p.s.i. steam, pressed oil-free press liquor returned to press cake and vacuum-dried.	4.9	53.6	11.9	22.3
100	Herring	Whole fish	Cooked 4-5 min. at 50 p.s.i. steam, pressed 5 min., dried in steam-jacketed drier at 212°F.	6.1	62.7	13.0	18.1
100	Herring	Whole and "brokers" fish	Cooked 4-5 min. at 50 p.s.i. steam, pressed 5 min., oil-free press liquor returned to press cake and vacuum-dried.	8.4	59.1	14.1	16.0
100	Menhaden	Whole fish	Cooked 4 min. at 40 p.s.i. steam, pressed 5 min. and dried in a steam-jacketed drier at 212°F.	9.4	56.8	20.0	15.4
100	Menhaden	Whole fish	Cooked 4-5 min. at 50 p.s.i. steam, pressed 5 min., oil-free press liquor returned to press cake and vacuum-dried.	2.0	66.5	13.0	16.1
100	Haddock	Filleted fish	Cooked 4 min. at 40 p.s.i. steam, pressed 5 min. and hot-air dried at 1400° to 1500°F.	7.9	59.3	4.9	26.0
100	Haddock	frames with viscera	Batch-cooked 6 hrs. at 100 p.s.i. steam, and dried in a steam-jacketed drier at 212°F.	7.3	53.3	18.9	20.9

products are often evolved during the oil separation process.

Processing menhaden into meal, condensed solubles, and oil is always a rapid operation carried out for meal on a tonnage basis, and for oil and solubles on a tank-car scale. Any interruption in the smooth flow of materials through the plant immediately creates a serious problem. When the emulsion in a tank of press liquor fails to break, the operator is usually forced to take what oil he can and discard the remaining intractable emulsion. Failure to break the emulsion results not only in a substantial financial loss, but creates a further problem of how to dispose of the emulsion.

In cases of such delay, it is recommended that the operator add from 200 to 300 gallons of press liquor from a tank that has already undergone a typical proteolytic action. This added liquor will serve as a starter culture to promote the desired break out of oil in the inactive tank.

Table 4 - Analyses of Sardine-Meal Samples Representing Large Batches of Meal

Type of Drier	Amount of Meal Repr. by Sample	Date Processed 1/	Proximate Composition				Vitamin Content (Moisture- and Oil-Free Basis)		
			Protein	Moisture	Oil	Ash	Riboflavin	Nicotinic Acid	Vitamin B_{12}
			(Percent)				(Micrograms Per Gram)		
Air-lift	Carload	10/13/50	59.4	9.9	7.4	20.8	4.2	73	0.23
		11/3/50	60.0	10.6	7.6	21.0	5.0	75	0.23
	1 day's production	11/14/50	53.6	13.3	7.0	-	2.6	42	0.22
Direct-heat	Carload	10/4/50	57.7	7.5	7.0	22.7	4.3	73	0.24
		10/14/50	59.0	7.7	7.3	21.8	5.0	82	0.29
			59.3	7.9	8.0	20.9	5.8	96	0.37
		10/4/50	59.8	7.0	8.5	21.0	5.4	85	0.23
		11/3/50	58.1	6.4	9.7	22.4	5.4	87	0.25
		10/8/50	59.6	7.7	9.3	17.0	5.8	89	0.26
		10/14/50	62.2	8.2	7.5	17.8	5.7	98	0.29
		10/6/50	57.4	8.7	7.5	22.9	5.0	66	0.22
		10/21/50	57.4	10.6	8.2	22.9	5.9	81	0.26
		11/1/50	56.6	10.6	7.7	23.8	5.3	69	0.23
		10/12/50	58.1	6.1	7.0	23.3	4.2	61	0.20
		11/4/50	58.6	8.3	7.3	22.7	4.7	69	0.26
		11/8/50	55.6	8.9	10.8	21.5	6.2	87	0.29
		10/13/50	65.2	3.9	7.4	18.8	5.0	93	0.29
		10/13/50	62.1	7.4	7.2	19.5	5.2	94	0.27
		10/20/50	66.9	7.8	7.1	14.8	7.3	115	0.33
		10/31/50	64.8	7.1	8.5	18.5	6.0	107	0.27
Modified direct-heat	1 day's production	11/14/50	57.2	7.5	7.9	-	3.8	80	0.24
Steam-tube	Carload	11/3/50	69.4	10.2	7.1	12.8	6.6	125	0.38
Unknown		10/13/50	60.2	8.8	8.0	18.7	5.4	89	0.31
		10/20/50	59.3	8.4	7.2	21.6	5.6	84	0.32
		11/3/50	63.2	4.8	8.8	-	4.7	74	0.24
Minimum			53.6	3.9	7.0	12.8	2.6	42	0.20
Average			60.0	8.2	7.9	20.3	5.2	84	0.27
Maximum			69.4	13.3	10.8	23.8	7.2	125	0.38
Standard deviation			3.68	1.98	0.95	2.85	1.0	17.4	0.046

1/Meals processed by the same company are grouped together.

6.190 THE FIELD HEMORRHAGIC-ANEMIC SYNDROME--NEW TREATMENT

Camp, A. A. (Texas Agricultural Experiment Station, Gonzales)
Feedstuffs 29, 20, 23-24 (June 8, 1957)

Hemorrhagic-anemia usually appears in an acute, sub-acute, or chronic form in broiler chicks four to six weeks of age. Chicks having the acute form are usually well fleshed with a very pale red to yellow-colored comb. Chicks in an acute conditions usually die in a sitting position. An autopsy usually shows (1) hemorrhages in almost any muscle or organ in the body of the chick, (2) very pale-colored muscles with a slight yellow tinge, (3) a very pale liver, and (4) stained blood smears that show megablasts.

Cure. --In early field tests, cod-fish liver solubles fed at the 5-percent level, in combination with trace mineral supplements containing iron, copper, zinc, cobalt, and other minerals cured the hemorrhagic-anemic condition provided treatment was continued for 7 to 14 days. This increased the cost by $15.00 to $20.00 per ton of ration.

The results of subsequent field tests with fish solubles, kelp, and minerals added to the feed by the turkey grower are shown in table 1 (see over). In these tests the control feed did not receive the added ingredients. Except for farm number 5, the chicks on all farms shown in table 1 received a starter diet that contained 2½-percent alfalfa meal, 5-percent fish meal, and 2 grams of menadione sodium bisulfite per ton of ration and a finisher diet that contained 5-percent alfalfa meal, 2½-percent fish meal, and 2 grams of menadione sodium bisulfite per ton of ration. The treatments employed under the conditions of the tests recorded in table 1 may be an effective and economical cure for this disease.

See table, over.

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ABSTRACTER: Martin Heerdt

6.193 DETERMINATION OF UNKNOWN GROWTH FACTORS IN FISH MEALS BY CHICK-GROWTH TESTS

Bird, H. R. (Department of Poultry Husbandry, University of Wisconsin, Madison) and Karrick, Neva L. (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review (Technology Supplement) 19, 1-3 (May 1957)

Fish meals appear to contain factors other than the known nutrients that are important in the diets of poultry. In order to measure the amounts of these factors present, samples of fish meal were compared with the unknown growth factors in a reference sample of fish solubles that had been assigned a value of 10 units. Chick-feeding tests were used to make the assays.

In the purified basal diet, soybean meal was used as the source of protein and sucrose as the source of carbohydrate. Supplements were added at the expense of the sucrose. Chicks were fed the diet with or without supplement from the time they were 1-day old until they were 4-weeks old. The growth effect of fish meals was compared to that of a standard sample of fish solubles. The standard solubles was included in each series of assays and was assigned a potency of 10 units per gram.

Both commercial fish meals and experimental fish meals were tested. The commercial meals were made from menhaden, tuna, and salmon waste. The experimental meals were made from pink salmon eggs, whole herring, pink shrimp waste, Dungeness crab waste, tuna waste, and sea-lion liver and viscera. The experimental meals were included in the study in an attempt to find a product exceptionally high in unknown growth factors.

Samples analyzed have had potencies ranging from 2.5 to 13.8 units. Eight commercial menhaden meals gave results that fell within this entire range of values. Two commercial tuna meals had 6.7

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ABSTRACTER: Kathryn L. Osterhaug

6.195 CARP MEAL AS A SUPPLEMENTARY SOURCE OF PROTEIN IN A BROILER RATION

Adams, A. W. and Carlson, C. W. (South Dakota Agricultural Experiment Station, Brookings)
Feedstuffs 29, 20 (June 1, 1957)

Purpose. --Carp meal was assayed for protein value in grower rations and compared with other protein supplements.

Experimental. --White Plymouth Rock chicks 20 days old were divided into five lots in replicate and fed over a 4-week experimental period. Lot 1 received a basal ration that contained about 22 percent protein and supplied 950 to 1000 calories of productive energy per pound of ration. Lots 2, 3, 4, and 5 received basal ration supplemented, respectively, with carp meal, fish blend, fish solubles, and fermentation byproducts at a level of 5 percent of the ration and at the expense of the soybean meal. Chick weight and feed consumption were recorded at weekly intervals.

Results. -- The basal ration gave a greater growth response than any of the supplemented rations; however, the difference between growth on the five rations was not significant. The carp-meal supplemented ration produced a slower rate of growth than either of the fish blend or fish solubles supplemented rations and also was least efficient in that 1.80 pounds of ration were required per pound of chick gain. The basal ration, in contrast, was the most efficient ration fed in that it required only 1.64 pounds of ration per pound of chick gain.

Discussion. -- The results obtained do not confirm the results of an earlier feeding study made with carp meals and reported upon by Anderson and Draper in Pacific Poultryman in 1955. These earlier studies showed that carp meal was equal or superior to various other fish meals for promoting growth in chicks. It appears likely therefore, that the basal ration was adequately supplemented

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ABSTRACTER: Martin Heerdt

7.599 A CHEMICAL METHOD FOR THE DETERMINATION OF HISTAMINE IN CANNED TUNA FISH

Sager, O. S. and Horwitz, William (Division of Food, Food and Drug Administration, Department of Health, Education, and Welfare, Washington 25, D.C.)
Journal of the Association of Official Agricultural Chemists 40, 892-904 (August 15, 1957)

Chemical method. --A chemical method for the determination of histamine was developed to avoid some of the difficulties of the bioassay method in which a segment of guinea pig ileum is used. The five major steps of the chemical method are: (1) extract histamine from the ground tuna fish in a Waring Blendor with methanol, (2) purify histamine by the formation of a Schiff base with benzaldehyde and by benzene-butanol extraction of the base with subsequent passage through an ion-exchanger (cotton acid succinate), (3) couple the eluted and purified histamine with diazotized p-nitroaniline at a carefully controlled pH of 8.6 to obtain an azo-dye, (4) purify and stabilize the azo-dye by extracting it with methyl isobutyl ketone and wash it with a barbital buffer, and (5) read the color spectrophotometrically.

Results. -- Assays of 82 samples of canned tuna, made according to the new method, showed that fish organoleptically classed as 0, 1, and 2 yielded little or no histamine. Tuna classed as 3 and 4, however, tended to yield amounts of histamine varying from 0 to 730 milligrams per 100 grams of fish.

Bioassay. -- By modifying the bioassay method so that the acid extractions were neutralized with sodium bicarbonate and Ringer-Locke solution in place of solid sodium carbonate, the author was able to eliminate discrepancies between the biological and chemical assay methods for histamine. Extracts of histamine obtained from tuna fish and neutralized in this manner had a uniform pH of about 7.5. In

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ABSTRACTER: Martin Heerdt

HEMORRHAGIC ANEMIA IN CHICKS

FISH MEAL ASSAYS

CARP PROTEIN FOR CHICKS

HISTAMINE IN CANNED TUNA

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and 5.6 units respectively and a commercial salmon meal had 2.5 units.

Not one of the experimental samples of meal proved to be equal in unknown growth factors to the solubles used as a standard. As the experimental samples were prepared under mild conditions, the variation is unknown. Growth factor content was probably due to differences in the raw material.

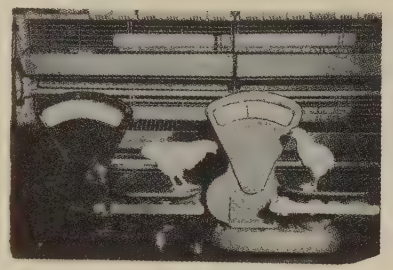

Fig. 3. The chicken on the right had been fed an unsupplemented basal diet. It weighed 200 grams. The chicken on the left had been fed the same diet plus 2 percent menhaden meal. It weighed 260 grams.

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this way, alkaline stimulation of the guinea pig ileum could be avoided, and the results obtained corresponded with those obtained by the chemical method.

Accuracy of method.--Collaborative results indicated that the method is reproducible.

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Table 1. Summary of Tests Concerning Treatment of the Hemorrhagic-Anemic Syndrome with Condensed Fish Solubles (5%) and 1% Dehydrated Kelp (Macrocystis pyrisera) with Added Copper, Cobalt and Manganese

Farm No.	No. of chicks on farm	No. of chicks treated	Age when treatment started	Length of treatment	Wt. of birds when sold		Feed conversion		Percent mortality		Percent nonsaleable	
					Control	Treated	Control	Treated	Control	Treated	Control	Treated
1	8,500	6,000	6 weeks 2 days	14 days	2.82	3.01	2.71	2.50	10.8	4.2	2.4	0.10
2	4,500	3,000	5 weeks 6 days	10 days	3.01	3.14	2.55	2.42	7.9	3.1	2.8	0.10
3	21,000	15,000	6 weeks	8 days	2.98	3.08	2.51	2.42	8.1	3.2	2.0	0.25
4	16,000	10,000	4 weeks 5 days	7 days	3.04	3.11	2.47	2.40	6.5	4.4	4.1	0.50
5	42,000	32,000	6 weeks 1 day	10 days	3.14	3.27	2.41	2.32	7.5	3.1	3.6	0.20
6	12,000	8,000	5 weeks 4 days	8 days	3.01	3.14	2.42	2.30	9.9	5.2	4.5	0.75
7	8,500	6,000	4 weeks	8 days	2.87	2.97	2.51	2.40	8.8	4.6	6.7	1.00
Total	112,500	80,000										
Av.	16,071	11,429	39 days	9.29 days	2.98	3.10	2.51	2.40	8.50	3.87	3.73	0.41

NOTE: In five out of seven farms, the non-treated birds were docked either 1c or 2c 1b. due to their inferior market quality.

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to produce optimum growth under the conditions of this experiment. The possibility also exists, however, that the method of preparation of the carp meal was detrimental to the retention of its maximum growth-promoting properties. Other possible reasons for the results obtained are the protein-energy ratio used and the inadequacy of the supplemented rations.

6.4 COMMERCIAL USES FOR MENHADEN OIL

Carver, Joseph (U. S. Fish and Wildlife Service, East Boston, Massachusette)
Commercial Fisheries Review (Technology Supplement) 19, 3-4 (April 1957)

This article is a review of work done by the Arthur D. Little Company under contract with the U. S. Fish and Wildlife Service with funds provided by the Saltonstall-Kennedy Act of 1954. The information was included in a final report submitted by that company to the U. S. Fish and Wildlife Service.

Three possible uses for hydroxylated menhaden oil were investigated: (1) polyisocyanate adhesives, (2) alkyd resins, and (3) isocyanate foams. Epoxidized oil was investigated as a possible plasticizer for polyvinyl chloride.

Hydroxylated oils showed some possibility for use in adhesive formulations. Hydroxylation, a readily controllable process, converts the double bonds to vicinal glycol structures. The following is a typical hydroxylation procedure: 288 grams of winterized and deodorized oil was mixed into 123 grams of acetic acid with 6 grams of sulfuric acid. The mixture was heated to 60° C., and 44.8 grams of 50 percent hydrogen peroxide was added slowly, keeping the temperature at 65 ± 5° C. the mixture was held at 65° C. for 4 hours with constant stirring. The reaction mixture was then washed with water, and with a 5-percent sodium carbonate solution. The product was extracted from the mixture with ether. After extraction, the ether solution was dried with magnesium sulfate, and the ether evaporated. The iodine number dropped from 179 in the raw oil to 127 in the product, indicating a loss of 28.8 percent unsaturation.

The hydroxylated oil was tried in various adhesive formulations. One formulation using 1-chloro-2,4-phenylene di-isocyanate (Mondur C) showed some promise.

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 ABSTRACTER: Kathryn L. Osterhaug

7.51 DYE-BINDING CHARACTERISTICS OF FISH-MEAL PROTEIN PART 1. SOME PRELIMINARY FINDINGS AS TO SUITABLE DYES

Thurston, Claude (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review (Technology Supplement) 19, 7-9 (May 1957)

The present method used to determine the nutritive value of fish-meal proteins is feeding tests that take from 1 to 3 weeks to complete. If a chemical test were available this time could be cut to a matter of hours.

Several of the investigations reported in the scientific literature indicate that the quality of vegetable proteins can be determined by their dye-binding characteristics. If a similar relationship exists between dyes and the proteins of fish meal it is possible that a chemical index could be established.

For this reason, an investigation was undertaken at the Seattle Technological Laboratory of the U. S. Fish and Wildlife Service in order to determine whether there is any correlation between the nutritive value of the fish meal as determined by chick-feeding tests and the extent of dye-binding. The specific objectives of the work reported here were to determine: (1) what dyes will bind the proteins of fish meal and (2) what the optimum conditions are for the use of these dyes.

Experimental.--More than 100 dyes, including all of the major types of chemical structures listed in the Color Index (Rowe 1924) have been screened. Most of these dyes had to be discarded for one or more of the following reasons: (1) the dye was insoluble in the buffer solution used; (2) solutions of maximum solubility failed to give adequate depth of color; (3) the dye adhered to the spectrophotometer cells to such an extent that the readings were valueless, and cleaning was unduly tedious; (4) the color faded on standing or on exposure to light; (5) the pH of the solution changed greatly on standing; (6) the color of the dye was discharged by the sample without apparent binding; or (7) the dye was not appreciably taken up by the meal.

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 ABSTRACTER: Kathryn L. Osterhaug

6.52 THIAMIN DEFICIENCY IN CATS

Anonymous
Nutrition Review 15, 190-191 (June 1957)

Introduction.--Foxes that were fed raw carp showed a distinctive clinical syndrome with predominantly nervous manifestations described as chastek paralysis according to R. G. Green (1936). The addition of thiamin to the diet cured the disease. Studies made by H. F. Deutsch and A. D. Hasler (1943) revealed that a thiamin-inactivating enzyme (thiaminase) was present in a number of American fresh water fish.

At Cornell University workers in veterinary medicine have found that a natural thiamin deficiency occurs if cats are maintained on a diet of canned commercial cat food that contains whole fish, K. V. Jubb, L. Z. Saunders, and Helen V. Coates (1956). The critical phase of the thiamin deficiency in the cats at Cornell was characterized by convulsions, head ventroflection, atoxia, and spastic tonus. These symptoms appeared to be identical with the symptoms produced by D. C. Smith and L. M. Proutt (1955) in cats by feeding them a diet of carp or salted herring. Ordinarily fish is considered to be an excellent food for cats, but the data presented by the workers at Cornell indicates that diets based primarily on whole fish may be detrimental to the health of cats.

According to the studies made at Cornell, as many as 60 different species of fish may be incorporated into commercially canned cat food. These fish are taken in the course of a year on the Atlantic, Gulf, and Pacific coasts of the United States. Not all of the different kinds of fish caught and used will lead to a thiamin deficiency. Variation also may be due to factors such as the species of fish and the method of processing used.

(over)

 ABSTRACTER: Martin Heerdt

7.642 DEVELOPMENT OF METHODS FOR BIOASSAY OF GROWTH FACTORS PRESENT IN FISHERY INDUSTRIAL PRODUCTS--PRELIMINARY INVESTIGATION OF PRESENCE OF UNIDENTIFIED NUTRITIONAL FACTORS

Ershoff, B. H. and Geiger, E. (University of Southern California, Los Angeles)
Commercial Fisheries Review (Technology Supplement) 19, 4-6 (May 1957)

Fish meals and condensed fish solubles have been demonstrated to contain, in addition to the known nutrients, factors essential for the optimum growth and development of poultry and other animals. According to the published data, however, the effect of these "unidentified factors" could not be demonstrated in all cases under laboratory conditions. A number of reasons may be responsible for this: (1) different batches of fish meal or fish solubles may contain different amounts of the active factor (or factors); (2) noxious or deleterious substances may have been produced in the preparation or processing of some of these supplements which masked the effect of the "unidentified growth factor;" (3) strain and species differences may exist in the animals' requirements for this factor(s); or (4) the growth-promoting effect of the unidentified factor in fish meal or condensed fish solubles may only be demonstrable in animals with certain kinds of intestinal flora. These complications not only retard work leading toward the isolation of the above unidentified factor(s) but make it difficult to determine the growth-promoting value of commercial fishery products.

The experiments described in this report were designed to develop a practical and reliable method for the bioassay of unidentified factors in industrial fishery products. It was recognized that any factors shown to exist by these methods would not necessarily be identical with the factor(s) that promote growth. It was hoped however, that assay procedures might be developed that are a more sensitive index to the quantity of these factors than the present method. Any new method developed would have to be correlated with the chick growth effect.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

6.52 (Cross Reference: 5.2, 6.53)

D. L. Coffin and J. Holzworth (1954) and D. R. Cordy (1954) have reported in the Cornell Veterinarian that cats on a diet of whole fish may be subject to steatitis or "yellow fat". These workers concluded that steatitis in cats results from the feeding of commercially canned cat food composed predominantly of whole fish. The cause of the steatitis condition was attributed to a deficiency of vitamin E, which was aggravated by the large amounts of unsaturated fatty acids in the diet of the cats.

6.4

The use of hydroxylated menhaden oils in the formation of alkyd resins and isocyanate foams showed very little promise.

The most promising results were obtained with epoxidized oils made from winterized and deodorized menhaden oils. Epoxidation of these oils should produce a commercially attractive plasticizer suitable for blending with other materials into resins such as polyvinyl chloride.

Epoxidation was carried out by adding with agitation, oil to a 10-percent solution of preformed peracetic acid at 20° C. The temperature was allowed to rise to 50° C., and the product was extracted in the same manner as the hydroxylated oil.

Some important considerations in using epoxidized menhaden oil as a plasticizer are as follows: (1) it does not bleed (the tendency of the plasticizer to "bleed" to the surface of the film thus producing an oily coating); (2) it has low volatility (the length of time a plasticizer remains in the compounded resin without evaporating); (3) it decomposes somewhat on heating; (4) it appears to be stable toward ultraviolet light; (5) it has no fire-retarding action; and (6) its extraction by water should be low.

7.642

If an essential nutrient distinct from any of the known nutritional factors does exist in fish meals, it is possible that it may exert demonstrable physiologic effect other than the indirect manifestation of increased growth. Experiments were accordingly undertaken to find such effects.

It is recognized that in addition to the known nutrients, substances are present in natural foodstuffs that are required in increased amounts under conditions of stress. The induction of nutritional deficiencies by exposing animals to various stressor agents and the correction of these deficiencies by the administration of graded levels of the missing nutrient have been employed by various investigators as a bioassay procedure. This technique was employed in the present project and evidence for the existence of such factors was obtained.

Findings indicate that the deleterious effects of alpha-estradial feeding on ovarian development in the immature rat could largely be counteracted by the concurrent feeding of sardine or tuna solubles at a 5 percent level in the ration. Although this method has possibilities as a bioassay procedure, it has the disadvantage of being time-consuming and relatively expensive.

This investigation was carried out under contract with the U. S. Fish and Wildlife Service.

7.51

Discussion.--On the basis of the above screening tests, eight dyes were found to exhibit satisfactory dye-binding characteristics. A summary of these findings is included.

Dye concentrations of from 0.0001 to 0.003 percent gave transmission ranges of from 90 to 10 percent in the spectrophotometer. The meal samples varied in particle size from 8 to 80 mesh, with 60 mesh giving the best results. From 5 to 25 milligrams (mg.) of meal were employed in 10 to 50 milliliters (ml.) of dye solution. The optimum ratio of meal to dye solution was in the order of 1 mg. of meal to 1 ml. of solution. The mixtures of meal and dye were shaken in a mechanical shaker from 2 to 24 hours, but 4 to 5 hours shaking was found to be adequate. Under these conditions, the meals bound 25 to 40 percent of the basic dyes and 60 to 90 percent of the acid dyes.

Summary of Experimental Results

Satisfactory acid dyes (pH 2.5):	Acid fuchsin Aniline blue Bromocresol green Alizarin red S Orange II Orange G
Satisfactory basic dyes (pH 11):	Congo red Tetrabromophenolblue
Optimum concentration of dye:	0.0001 to 0.003 percent
Optimum particle size of meal:	60 mesh
Optimum meal-to-dye ratio:	1 milligram of meal to 1 milliliter of dye solution
Optimum time of shaking:	4½ hours
Amount of dye bound by meal:	25 to 40 percent of basic dye 60 to 90 percent of acid dye

Sufficient data are not yet available to determine the relationship of the dye binding characteristics of the meals to the nutritive value of their protein.

0.5 A NEW SPECIES OF BACTERIUM WHICH PRODUCES LARGE AMOUNTS OF HISTAMINE ON FISH MEATS, FOUND IN SPOILED FRESH FISH

Kimata, M. and Kawai, A.
Mem. Res. Inst. Food Sci., Kyoto Univ., No. 6, pp. 1-2 (1953)
Food Science Abstracts 29, 128 (April 1957)

A description is given of the morphology and biochemistry of a new species of bacterium, Achromobacter histamineum. It was isolated from spoiled fish, from which it produces large amounts of histamine. It produces ammonia from urea, but not from amino acids.

0.5 THE PRODUCTION OF HISTAMINE BY THE ACTION OF BACTERIA CAUSING THE SPOILAGE OF FRESH FISH

Kimata, M. and Kawai, A.
Bull. Res. Inst. Food Sci., Kyoto Univ., No. 12, pp. 29-33 (1953)
Food Science Abstracts 29, 128 (April 1957)

Of 25 strains of bacteria causing spoilage of fish, only one produced histamine to any extent.

0.5 ON THE UREA-SPLITTING BACTERIA CAUSING THE SPOILAGE OF FRESH FISH

Kimata, M. and Hata, Y.
Mem. Res. Inst. Food Sci., Kyoto Univ., No. 5, pp. 54-64 (1953)
Food Science Abstracts 29, 128 (April 1957)

1.87 STUDIES ON THE BLACK DISCOLORATION OF LOBSTER

Kakimoto, Daiichi and Kanazawa, Akio
Bulletin of the Japanese Society of Scientific Fisheries 22, No. 8, 471-479 (1956) (English synopsis and tables)

I. Origin of discoloration. --The black discoloration was confirmed to be due to the black pigments formed by the action of an enzyme in blood on a certain constituent of the liver.
II. Relation between tyrosinase and black discoloration. -- The distribution of tyrosine and tyrosinase in organs of a lobster, Panulirus japonicus, was examined. Blood was found to be most powerful in tyrosinase activity. In other organs the activity was in the order of stomach, intestines, liver, gonad and muscle. P-aminobenzoic acid revealed an inhibitory effect on the darkening reaction.

1.87 VISUAL PIGMENT OF A DECAPOD CRUSTACEAN: THE LOBSTER, HOMARUS AMERICANUS

Wald, George and Hubbard, Ruth (Harvard University, Cambridge, Massachusetts)
Nature 180, 278-280 (August 10, 1957)

The present communication describes the photosensitive pigment from the eye of a decapod crustacean, the lobster (Homarus americanus). The photosensitive pigment possesses an absorption maximum (λ max.) at about 151 mμ. For the present we shall call this pigment 'lobster rhodopsin'.

2.00 VOLATILE ACIDS, SUCCINIC ACID, AND HISTAMINE AS INDICES OF DECOMPOSITION IN TUNA

Hillig, Fred
Journal of the Association of Official Agricultural Chemists 39, 773-800 (August 15, 1956)

(Abstract of this article appears under 3.331 page 9 - July 1957)

2.00 THE QUALITY ESTIMATION OF FRESH FISH

Anonymous
Arsberetning fra Fiskeriministeriets Forsogslaboratorium for 1956 (Annual Report to the Danish Fishing industry with English translation of the main experimental results) 29-31 (1957) (Copenhagen, Denmark)

The following periods of keeping quality at 0° C. have been calculated from experimental data:
Cod: 12 days
Plaice: 15 days
Dab: 9 to 10 days
It was shown that in the temperature regions around 0° C., a temperature difference of 1° C. corresponded to a variation in the period of keeping quality of about 10 percent.

3.23 AUTOMATION AND THE KITCHEN

Gould, Wilbur A.
Food Packer 37, 36, 48 (May 1956)

(Abstract of this article appears under 0.12 page 1 - January 1957)

3.23 FROZEN FISH. IMPROVED QUALITY AND PACKING AS A WAY TO IMPROVED MARKETING AND CONSUMPTION

Anonymous
The European Productivity Agency of O.E.E.C., Project No. 325 (Paris) 158 pp. (1956)
Food Science Abstracts 29, 123 (April 1957)

A report of a training course, held at Kiel in March 1955. The text of the following papers is included: the handling of the raw materials used in the production of frozen fish products (by H. Einarsson); technical problems related to the fish freezing process (by J. Kuprianoff); problems related to the packing and storage of frozen fish (by O. Karsti); practical questions of quality protection during the storage of frozen fish (by J. Lorentzen); transport and distribution of frozen fish (by E. Waller); marketing and other economic problems in frozen fish production and distribution (by G. Meseck); quality control of fish and fishery products in Denmark with special reference to frozen fish (by P. F. Jensen).

3.331 IRON SULFIDE DISCOLORATION OF TUNA CANS. NO. 4. EFFECT OF RETORTING AND COOLING CANNED FISH

Pigott, George M. and Stansby, M. E.
Commercial Fisheries Review 18, 13-16 (December 1956)

(Abstract of this article appears under 3.338 page 15 - June 1957)

3.331 IRON SULFIDE DISCOLORATION OF TUNA CAN NO. 5. EFFECT OF SALT, OIL, AND MISCELLANEOUS ADDITIVES

Pigott, George M. and Stansby, M. E.
Commercial Fisheries Review 19, 7-9 (February 1957)

(Abstract of this article appears under 3.338 page 9 - August 1957)

3.331 THE TECHNOLOGY OF FISH CANNING. INDUSTRIAL PROCESSING OF TUNNY

Buffa, A.
Cons. Deriv. agrum., 2, 172-177 (1953)
Food Science Abstracts 29, 125 (April 1957)

3.9 METHOD OF PRESERVING SHRIMP

Toulmin, Harry A., Jr. (Commonwealth Engineering Company of Ohio, Dayton)
U. S. Patent 2,758,929, 3 pp. (August 14, 1956)

These and other objects are accomplished by storing the freshly netted, unpeeled shrimp in an aqueous dispersion, which term includes aqueous solutions, of a water-dispersible, including water-soluble, dextran.

This invention relates to the preservation of freshly netted shrimp during transportation thereof from the fishing grounds to the packing plant.

3.9 METHOD OF PRESERVING SHRIMP

Toulmin, Harry A., Jr. (Commonwealth Engineering Company of Ohio, Dayton)
U. S. Patent 2,758,930, 3 pp. (August 14, 1956)

This invention relates to the art of preserving peeled shrimp.

What is claimed is: the method of preserving peeled and cleaned shrimp which comprises contacting the shrimp with an aqueous medium consisting essentially of an 0.5% to 20% aqueous dispersion of water-dispersible dextran, said dextran having a molecular weight between 20,000 and that of the native, unhydrolyzed dextran.

4.11 FISH OILS VII. THE PIGMENTS OF PILCHARD OIL

Bailey, B. E.
Journal of the Fisheries Research Board of Canada 4, 55-58 (April 1938)

(Abstract of this article appears under 8.59 page 15 - July 1957)

4.11 FISH OILS VIII. THE APPROXIMATE COMPOSITION OF THE FATTY ACIDS OF THE OIL OF PILCHARD (SARDINOPS CAERULEA)

Brocklesby, H. N. and Harding, K. F.
Journal of the Fisheries Research Board of Canada 4, 59-62 (April 1938)

(Abstract of this article appears under 4.13 page 9 - August 1957)

4.11 PAPER CHROMATOGRAPHY OF PHOSPHOLIPIDES ON SILICIC ACID-IMPREGNATED GLASS-FILTER PAPER

Dieckert, Julius W. and Reiser, Raymond (Texas A & M College System, College Station)
J. Am. Oil Chemists' Soc. 33, 535-7 (1956)
Chemical Abstracts 51, 741 (January 10, 1957)

4.14 (Cross Reference: 1.95)

STUDIES ON THE PIGMENTS OF WHALE OIL

Mukai, Katsunori
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 3, 187-193 (1955) (English abstract, figures, and tables)

VIII. The relation between the coloration of whale oil and the amount of hemoglobin added to raw blubber.

IX. The relation between the coloration of whale oil and the amounts of porphyric substances added to raw blubber.

4.14 STUDIES ON THE WHALE OIL (PART 1)

Saiki, Masamichi and Mori, Takajiro
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 9, 1041-1044 (1956) (English abstract and tables)

Fatty acids composition of oil from Calanus cristatus collected in the stomach of fin whale caught at the Northern Pacific Ocean.

4.29 STUDIES ON UTILIZATION OF THE LIVER OIL OF DEEP SEA SHARKS

Higashi, Hedeo; Iseki, Shigeo; and Asano, Motoaki
Bulletin of the Japanese Society of Scientific Fisheries 22, No. 6, 378-382 (1956) (English synopsis, figure, and tables)

XII. Preparation of polymerized product from squalene (1) polymerization of squalene using acid clay as catalyst.

4.29 ELAIDINATION OF OLEIC ACID WITH SELENIUM AS A CATALYST

Mehta, T. N.; Rao, C. V. N.; and Rao, K. S. (Lasminarayan Inst. Technol., Nagpur)
Indian Soap J. 21, 37-8 (1955)
Chemical Abstracts 51, 742 (January 10, 1957)

4.29 PHOSPHOLIPIDES PART II. THE STABILITY OF SOME DERIVATIVES OF 2-AMINOETHYL PHOSPHATE

Brown, D. M. and Osborne, G. O.
Journal of the Chemical Society (England) p. 2590 (June 1957)

6.138 ACIDIFICATION OF FISH-LIVER OILS AND FISH OILS

Bruzac, Jean F. A.
FR. 998,607 (January 21, 1952)
Chemical Abstracts 50, 15105 (October 25, 1956)

Fish oils and fish-liver oils, e.g., those used in leather manuf., have very low acidities e.g., <1%, while an acidity of >10% is desired. To acidify such oils, they are inoculated with acid-forming bacteria and aerated or treated with O_2, O_3, or ozonized air under pressure to accelerate acidification and to ensure equal distribution of the bacteria in the oil.

6.138 HYDROGENATION OF FISH OILS

Itakura, Seiichi
Japan 1079, (February 19, 1955)
Chemical Abstracts 50, 17491 (November 25, 1956)

The vessels contg; fish oil and the hydrogenation catalyst, e.g., Fe, Ni, or Raney Ni, is equipped with coil of Fe or Cu wire. d.c. at 50 v. and 1 amp. is passed through the coil in order to produce a magnetic field in the vessel and to cause rapid motion of the magnetized catalyst during the hydrogenation at 60 to 190°.

6.14 THE NUTRITIVE VALUE OF HERRING MEALS 3. THE EFFECT OF HEAT TREATMENT AND STORAGE TEMPERATURE AS RELATED TO OIL CONTENT

Biely, J.; March, B. E.; and Tarr, H. L. A.
Poultry Science 34, 1274-9 (November 1955)

(Abstract of this article appears under 6.190 page 13 - July 1956)

6.14 USE OF ANTIOXIDANT IN PAPERBOARD

Doyle, M. E.; Sullivan, R. D.; and Booth, H. G.
Modern Packaging 29, 119-123, 195 (July 1956)

(Abstract of this article appears under 3.238 page 13 - February 1957)

6.14 STUDIES ON FEED SPOILAGE

Halick, John V.; Richardson, L. R.; and Cline, Margaret (Texas Agricultural Experiment Station)
Feedstuffs 29, 26-36 (August 10, 1957)

Critical moisture levels at which heating began in protein concentration after 17 to 38 days of storage at 90° F. and 70 percent relative humidity were as follows: unknown fish meal--11.6 percent, menhaden meal 10.3 to 10.7 percent, and menhaden fish scrap 10.1 to 10.9 percent.

6.193 STUDIES ON UTILIZATION OF TRIMMINGS WASTED IN MANUFACTURING COOKED FISH PASTE

Tomiyama, Tetuo; Yone, Yasuo; Hirowatari, Kazuyuki; Koyanagi, Takeo; Uchida, Shogoro; and Tokuda, Hisao
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 10, 1086-1092 (1956) (English abstract, figures, and tables)

6.193 FURTHER EVIDENCE FOR AN UNIDENTIFIED FACTOR REQUIRED IN A PURIFIED DIET FOR NORMAL HATCHABILITY

Kurnick, A. A.; Svacha, R. L.; Reid, B. L.; and Couch, J. R. (Texas A. & M. College System, College Station)
Poultry Science 35, 658-662 (May 1956)

6.193 NUTRITION PAPERS PRESENTED AT CHEMISTS' MEETING

Anonymous
Feedstuffs 29, 64-65 (June 15, 1957)

U.G.F. concentrates. -- Through fermentation technology, these growth factors can be produced and highly concentrated.

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

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Analytical Chemistry
Archives of Biochemistry and Biophysics
Biochemical Journal
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemistry
Canadian Journal of Technology
Canner and Freezer
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmetic Industry
FAO Fisheries Bulletin
Federation Proceedings
Feed Bag (supersedes Flour and Feed)
Feedstuffs
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Packer
Food Preservation Quarterly
Food Processing
Food Research
Food Science Abstracts
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Industrial Refrigeration
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Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
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National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Pan American Fisherman
Poultry Science
Practical Home Economics
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Southern Fisherman
Trade News (Fisheries Department, Canada)
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

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Editorial Clerk (Typist)--Gladys K. Chandler

6.195 THE PROTEIN REQUIREMENTS OF ANIMALS INCLUDING MAN

Block, Richard J.
Borden's Review of Nutrition Research 17, 75-96 (November-December 1956)

(Abstract of this article appears under 0.7 page 3 - June 1957)

6.195 FISH MEAL AS A PROTEIN SUPPLEMENT

Cravioto, Rene O.; Garcia, Jesus Guzman; Cravioto, Omar Y.; Suarez, Maria de la Luz; and Massieu, H. Guillermo
Ciencia (Mex.) 15, 83-8 (1955)
Chemical Abstracts 50, 17241 (November 25, 1956)

6.195 THE EFFECT OF INCREASED DIETARY FAT UPON THE PROTEIN REQUIREMENT OF THE GROWING DOG

Ontko, Joseph A.; Wuthier, Roy E.; Phillips, Paul H. (Department of Biochemistry, University of Wisconsin, Madison)
The Journal of Nutrition 62, 163-169 (June 10, 1957)

A diet which contained 20 percent fat needed 25.0 percent protein to obtain a maximum growth response in the weanling pup in these experiments. Further increases in protein were needed to obtain a maximum growth and food efficiency rate when the diet contained 30 percent fat. The food efficiency for the weanling pup was distinctly superior with the 30 percent fat diet over that with the diet which contained 20 percent fat.

6.3 STUDIES ON THE PREPARATION AND PURIFICATION OF ALGINIC ACID BY ELECTRODIALYSIS

Kojima, Yoshio
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 12, 1253-1260 (1956) (English abstract and figures)

I. Conditions for extracting alginic acid from Eckloria cava were examined with regard to yield and properties of alginic acid.
II. A sodium alginate solution prepared from Eckloria cava at the optimum condition was electrodialyzed with two chambers, depositing alginic acid on the anode. Yield and purity of alginic acid attained were nearly equal to those by the ordinary method.

6.3 STUDIES ON MUCILAGE FROM THE SEAWEED, EUCHEUMA SPINOSUM

Nakamura, Takehiko
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 10, 1053-1056 (1956)

II. Separation of pure mucilage.
III. Studies on component sugars of cold extract.

7.595 ANTIOXIDANT ANALYSIS. DETERMINATION OF ANTIOXIDANTS IN EDIBLE FATS

Anglin, Constance; Mahon, J. H.; and Chapman, Ross A. (Department of National Health and Welfare, Ottawa, Canada)
Journal of Agricultural and Food Chemistry 4, 1018-1022 (December 1956)

7.595 THE QUANTITATIVE DETERMINATION OF THE ANTIOXIDANTS PROPYL, OCTYL AND DODECYL GALLATE IN OILS AND FATS

Vos, H. J.; Wessels, H.; and Six, C. W. Th. (Central Institute for Nutrition Research, T.N.O., Utrecht, The Netherlands)
The Analyst 82, 362-367 (May 1957)

Propyl, octyl and dodecyl gallates are determined absorptiometrically in a sodium acetate buffer solution with ferrous tartrate, which is specific for the gallates. After solution of the fat in light petroleum, propyl gallate is extracted with water and the higher gallates with absolute methanol. The conditions governing the reaction were studied. With the extraction methods described a 95 to 97 percent recovery of antioxidant from oils and fats was possible.

7.8 OBJECTIVE TESTS APPLICABLE TO QUALITY STUDIES OF ICE STORED SHRIMP

Bailey, M. E.; Fieger, E. A.; and Novak, A. F.
Food Research 21, 611-620 (November-December 1956)

(Abstract of this article appears under 2.19 page 5 - May 1957)

7.8 ORGANOLEPTIC WINE-QUALITY EVALUATION I. STANDARDS OF QUALITY AND SCORING VS. RATING SCALES

Filipello, F. (Department of Food Technology, University of California, Davis)
Food Technology 11, 47-51 (January 1957)

7.8 ORGANOLEPTIC WINE-QUALITY EVALUATION II. PERFORMANCE OF JUDGES

Filipello, F. (Department of Food Technology, University of California, Davis)
Food Technology 11, 51-53 (January 1957)

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Storage of iced fish	21	2.00
Tuna		
Radioiron in skipjack	29	8.42
Whales and other marine mammals		
Whale oil pigments	23	4.14

8.42 STUDIES ON THE RADIOACTIVITY IN CERTAIN PELAGIC FISH--IV.

Amano, Keishi; Tozawa, Harumi; and Takase, Akira
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 12, 1261-1268 (1956) (English abstract, figures, and table)

8.42 ARSENIC CONTENT OF SOME SHELLFISH OF THE PERUVIAN COAST

Moyano, C.
S. Bol. Soc. quim. Peru 22, 5-16 (1956)
Food Science Abstracts 28, 572 (December 1956)

The arsenic contents of mussel (Mytilus magellanicus), crab (Panapens herbestti?), clam (Mesodesma donacia), sea snail (Concholepas concholepas), scallop (Pecten jacobaeus), and black snail (Thais chocolata) were determined during the months of March to July. The amounts of arsenic present ranged from about 0.363 to 3.124 mg. per 100 g. of fresh material.

8.42 CALCIUM OXALATE IN THE CRYSTALLINE STYLE OF SOME MOLLUSKS

Kato, Kojiro and Kubomura, Kazuko (Saitama Univ., Urawa)
Sci. Repts. Saitama Univ. Ser. B, 2, 15-20 (1955)
Chemical Abstracts 51, 6022 (April 25, 1957)

The cryst. style of certain native univalve and bivalve mollusks was found to contain 0.06 to 0.25% oxalic acid and 0.15 to 0.25% Ca.

8.51 METHIONINE CONTENT OF PROTEINS OF FISH AND FISH PRODUCTS

Gorozhankina, L. A. (Nutrition Inst., Acad. Med. Sci. U.S.S.R., Moscow)
Voprosy Pitaniya 14, No. 5, 35-36 (1955)
Chemical Abstracts 50, 13324 (September 25, 1956)

The methionine content of 21 kinds of fish is tabulated. The amt. of this amino acid ranged from 1.60 in sprats preserved in oil to 2.35% of the total N in pilchards, resp. Other fish rich in methionine are: soudre, cod, catfish, salmon, and sturgeon.

8.51 AMINO ACID COMPOSITION OF FISH MUSCLE PROTEIN

Konosu, Shoji; Katori, Shin-ichi; Ota, Ryozo; Eguchi, Sadanari; and Mori, Takajiro
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 11, 1163-1166 (1956) (English abstract and tables)

The amino acid composition of fish muscle proteins is relatively constant without distinction between species, including cuttle-fish and shark.

8.51 NUTRITIVE VALUE OF FISH I. NICOTINIC ACID, RIBOFLAVIN, VITAMIN B_{12}, AND AMINO ACIDS OF VARIOUS SALT-WATER SPECIES

Teeri, A. E.; Loughlin, M. E.; and Josselyn, D.
Food Research 22, 145-150 (March-April 1957)

(Abstract of this article appears under 8.0 page 15 - October 1957)

8.64 (Cross Reference: 1.89)

STUDIES ON VITAMIN B_{12} OF AQUATIC ANIMALS

Yanase, Masaaki
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 3, 194-203 (1955) (English abstract and tables)

V. Vitamin B_{12} of the starfish.
VI. The vitamin B_{12} level in the gastric and intestinal contents of fish.

8.64 B-VITAMINS CONTENT IN THE MUSCLE OF FISH

Mori, Takajiro; Hashimoto, Yoshiro and Komata, Yasushi
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 12, 1233-1235 (1956) (English abstract and tables)

The red muscle of fish is very rich in thiamine, riboflavin and vitamin B_{12}, but contains less niacin than the ordinary muscle. In Katsuwonus vagans, the amounts of thiamine, riboflavin and vitamin B_{12} in red muscle were respectively, approximately 9, 20, and 6 times those in ordinary muscle.

8.64 B-VITAMINS IN MARINE PRODUCTS AND THEIR CHANGES IN PROCESSING AND STORAGE

Komata, Yasushi; Hashimoto, Yoshiro; and Moro, Takajiro
Bulletin of the Japanese Society of Scientific Fisheries 21, No. 12, 1236-1240 (1956) (English abstract and tables)

9.6 THE CHEMISTRY OF FATTY ACIDS

Anonymous
Fatty Acids Department, Armour Chemical Division, Armour and Company, Chicago, Illinois (1956)

9.6 INDEX AND LIST OF TITLES, PUBLICATIONS OF THE FISHERIES RESEARCH BOARD OF CANADA, 1901-1954

Bishop, Yvonne; Carter, Neal M.; Gailus, Dorothy; Ricker, W. E.; and Speirs, J. Murray
Bulletin No. 110, Fisheries Research Board of Canada (1957) (Ottawa)

9.6 DEEP SEA TRAWLING (THE GRANTON TRAWL)

Garner, John
Gourock Ropework Co., Ltd. (1956) (England)
World Fishing 6, 45-47 (April 1957)

"Deckie learners" and those fishermen at home and overseas who are unfamiliar with this form of fishing should find the material in this book invaluable. Illustrated in color.

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